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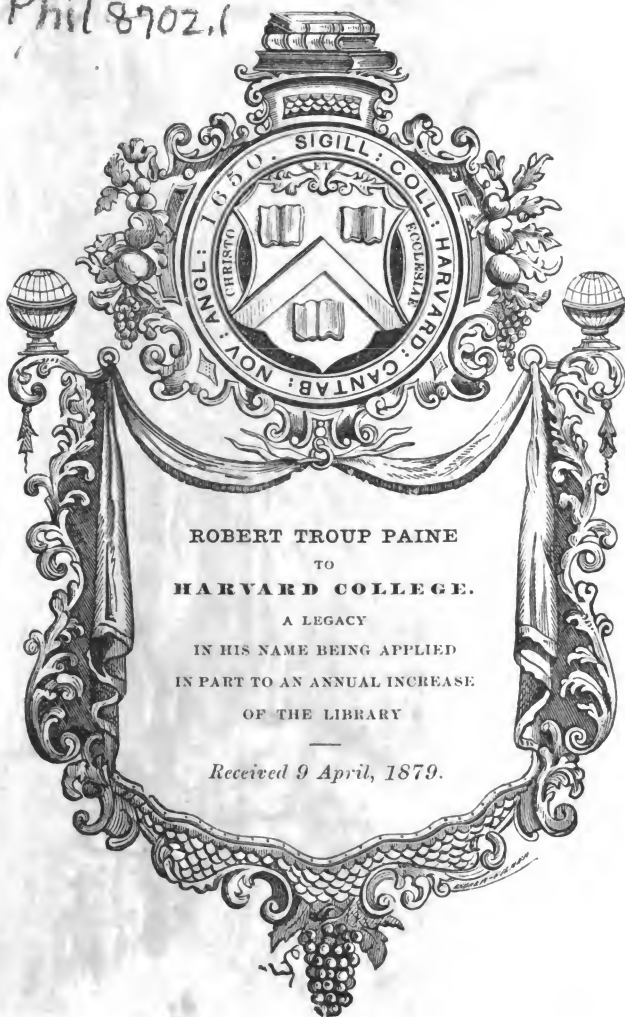
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GEOLOGY
AND
GEOLOGISTS.
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GEOLOGY AND GEOLOGISTS:

OR,

VISIONS OF PHILOSOPHERS

IN THE

NINETEENTH CENTURY.

BY THE

AUTHOR OF "THE GOODNESS OF DIVINE PROVIDENCE,"

&c., &c.

Robert Maxwell Macphair.

We have no experience in the creation of worlds.—CHALMERS.

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GEOLOGY AND GEOLOGISTS.

THE GEOLOGICAL PROTEUS.

No one will feel disposed to deny, that science has rapidly improved during the last few years; and has made us acquainted with many physical facts and principles of which we were previously ignorant. These facts and principles have generally been tested by an impartial scrutiny or a severe analysis; since learned men have usually been unwilling to admit the truth of any theory which will not bear a strict investigation. It would have been well for the credit of philosophers, had they exhibited a similar spirit of inquiry upon all occasions, and had refused to receive any hypothesis which could not be substantiated by an adequate proof. But the groundless opinions which they have entertained upon some subjects, and the theories which have been illogically raised from a few extravagant notions, are sufficient to throw a degree of suspicion upon all their reasonings: so that both the truth and error of their systems have been quickly discarded by numerous inquirers. It has too often happened, that a scheme founded upon very insufficient *data* has prepossessed the philosophic mind, the whole of whose subsequent efforts have been directed to establish his favourite hypothesis, without paying much attention to the difficulties with which it has been surrounded. All nature has been ransacked for materials wherewith to uphold the fancied fabric; mere shadows have been adopted for pillars of argument; the most glaring inconsistencies have been overlooked; and bold pretensions or high-sounding names have been used to gain over the unlettered part of the community.

In no science has this been more the case than in Geology; whose devotees have, with an ardour worthy of a better cause, been laboriously constructing some of the wildest schemes that ever entered into the imagination of man. Yet, strange to say, though several systems contradict themselves and one another on a hundred points, a deference has been paid to their

vagaries by the scientific world that is altogether extraordinary ; whilst the commonalty have looked on with amazement or terror, some hoping for a new exhibition of wonders, others fearing lest the ground of solid truth should eventually be shaken.

Reasons might be assigned for these very different kinds of feeling with which modern Geology has been regarded. A love of the marvellous seems natural to the human mind ; whence it happens that any bold projector of a wonderful system will quickly obtain a multitude of adherents ; and the more extravagant his doctrine, if it be only supported by a show of philosophy, the more likely is it to be admired. But there is also in the heart of man a proneness to infidelity, which makes it grasp at every thing that can throw any suspicion upon the truth of the Bible ; and amongst the votaries of science, there has frequently been a lamentable effort to banish a superintending Creator and providential Governor from his own world, by trying to account for every thing without his interposition. They worship the laws of Nature instead of Nature's God ; and seem to account it a triumph when they can perceive any imagined discrepancy between the facts of natural history and the declared truths of revelation. We are aware that some cosmogonists affirm that there is no real opposition between the current geological systems and the scriptural record of ancient events ; that the two accounts can be easily harmonized ; and that Moses and modern philosophers may be made to agree on subjects of natural history, however widely they may differ on religious topics. But this doctrine of accommodation can only be maintained by adopting a mode of biblical interpretation, far from according with the beautiful simplicity that marks every other part of holy writ.

Perceiving this evil, and animated with a laudable zeal to defend the faith once delivered to the saints, several Christian writers have endeavoured to check the rising systems of cosmogony. They have, however, been borne down by the superior strength of the opposing current ; and Geology still pursues her impetuous course, over precipices and under mountains, in the open plain and through fissures of the rocks, amidst central heat and polar cold,—now stagnating for a million of ages, (which are easily reckoned with a calculating-machine,) then boiling, bubbling, rushing headlong, and sweeping the world with a besom of destruction,—yet, marvellous to relate, leaving the germs of a new creation behind it, to become like a phoenix from its ashes, more glorious by means of a temporary dissolution.

The antagonists of Geology have not had fair play, nor have they always acted prudently in their mode of conflict. The enemy with which they have had to grapple is a perfect Proteus, changing his dogmas almost as frequently as the chameleon alters its colour. A few years ago, the *water* system of Baron Cuvier seemed to have extinguished the central fire of Hutton: but the latter was only smothered for a season—not defunct; for it has now so much revived as to have taken possession of the interior of our globe, leaving the outside only to the water; whilst the unfortunate crust of the earth is sorely vexed in its perilous situation between these rival elements, each of which has made fearful inroads upon its strata. Which of the two will finally conquer, has not yet been determined; though Dr. Pye Smith seems certain, in contrariety to Moses and St. Peter, that water will cause the next grand catastrophe. Why, then, should geologists complain so vehemently, as this reverend gentleman does, if a simple man should refuse to believe in this vaunted science, until its own professors shall have come to an agreement upon its first principles? We always thought that a science was something of a determinate shape, the truth of which any one might verify for himself, by following certain prescribed rules or modes of examination. Yet here is a body which will only bear dissection in its surface; for the moment that we put the scalpel a little inwards, there bursts forth a stream of fire or water which effectually hinders any farther operations.

Nor have we sufficient time to determine the outer strata of our planet, before we are interrupted by a new discovery, which nullifies all our former experience. A short time ago, Baron Cuvier was the *ne plus ultra* of Geology. His splendid discoveries in comparative anatomy seemed eminently to qualify him for anatomizing the structure of our globe; and he was supposed to know as much about the dead world under our feet, as he did concerning the living races of men and beasts. He nobly asserted the divine creation of our species, and that it must have occurred about the time mentioned by Moses; and thus he quashed the sceptical notions of former geologists, who supposed man to have existed for a vast period of time, and to have been gradually formed out of inferior beings by a progressive march of intellect in the combinations of matter. Cuvier, on the most incontrovertible grounds, overthrew these hypotheses, and proved that the human species had not lost its monkey-tail, according to Lord Monboddó, but had been really *made a man* at the very

outset. To the utter confusion of French infidels, the Baron also showed Moses to have been right in his narration of a general deluge. It exactly corresponded with his Neptunian views; and he joyfully hailed so divine a testimony to his favourite system. However, he disagreed with the Jewish historian on one or two points of the narrative; and of course, believing himself to be in the right, he tried to adapt the meaning of the scriptural record to suit his own views. This was easily done by supposing Moses to speak figuratively respecting the "six days' work" of creation; and, by the ready transformation of a day into a thousand or myriad of years, since people lived so long in primitive times that their epochs should not be measured by our puny standard, he solved the apparent difficulty. Having thus found the sacred historian to speak indefinitely on one point, it was natural to judge of some of his other expressions in a similar way. For the Baron's grand discovery of the laws of *genera* and *species* showed, that there were three distinct species of the human family, besides all their peculiar varieties; and the creation of all animal genera *in pairs* would not suit his theory. Cuvier's views were warmly espoused by Jameson, Silliman, and others; and Moses's authority as an historian seemed to be restored—except in his figurative language of "the six days," and his ignorance of the determinate character of species. Accordingly, when some pious Christians began to raise their voice against so lax an interpretation of Scripture, they were greatly blamed for their illiberality, and were warned of the dreadful consequences which must ensue to religion should they continue to oppose the ascertained facts of Geology, as described by all the most eminent philosophers of the age.

The fears of the faithful soon proved as groundless as their arguments were unsuccessful. The stroke which was aimed at their Proteus adversary fell powerlessly to the earth; for, by a sudden shift of position, he abandoned his former ground, and the whole controversy had to be taken up anew. How had the fame of the mighty fallen in ten short years! Our celebrated Frenchman had founded his theory upon an intimate acquaintance with the brute creation; but an Englishman was now courting the aid of the finny tribe; and the gigantic mammoths and *feræ* of the Paris basin were destined to succumb to the *testacea* of the Silurian system. So great were the triumphs of the latter, as quite to eclipse the achievements of the former. Cuvier's sixty thousand years were speedily transformed into

millions of ages ; and the very arguments which he had employed with such success in supporting the empire of Neptune, were now turned against him, in defence of Pluto. This great naturalist was just about to deposit his own dust, to form part of the alluvium of a new world, when all his cherished *diluvia* were unceremoniously swept away : and whether the philosopher's bones shall be hereafter discovered in a bed of limestone, or be finally consumed by the central fire, is a problem that now remains to be solved.

In about ten years—so changing are the speculations of theorizing men—a complete revolution has been effected in the geological world. As it fared with the French Baron and his adherents, so has it with the supposed doctrines of the Jewish lawgiver. It is easy to trample upon a dead lion ; and Cuvier no longer exists to maintain his interpretation of Moses. The length of the “six days’ work” is not now a matter of dispute. The sentiment is either received in the common-sense interpretation of the words, or is altogether repudiated as a mere idiom of the Hebrew tongue. Of course, Christian divines who have embraced cosmogony maintain the former position ; philosophic worshippers of *Nature and her laws* surmise the latter. Cuvier had thought it necessary to allow the Creator a few myriads of years to bring this world out of chaos, and shape it into its present form ; but his successors hold a million of ages to be a trifling period for completing so intricate a work. They, therefore, make an unlimited demand upon time, leaving a blank for this purpose between the first and second verses of Genesis.

Nor need we wonder at this greater necessity for time, when we consider the altered materials out of which our system is said to have been formed. Old geologists took up the notions of Ovid and of ancient tradition, supposing the chaos of our globe to have been a crude mixture of earth and water : and, having such tangible substances to deal with, they went about their work in a mason-like manner—laying a solid foundation of heavy materials, and building the upper stories of lighter stuff. But more recent philosophers expect to prove by astronomical observations and mathematical calculations, that the earth which we inhabit was once a vaporous cloud, which has been condensed, hardened, softened, burnt from within, deluged from without, disintegrated, re-made, and now constituting a fiery liquid with a thin outer crust on which we live, which rises, falls, and undulates according to the pressure of a few sand-banks on

its surface. Really, Dr. Pye Smith must not find fault with us if we cannot retain our gravity; nor must he crossly designate our lucubrations as "crude impertinence," if we express our utter disbelief of his wild hypothesis.

It has also lately been discovered, that the *drift gravel* found upon alluvial soils, instead of being an irresistible argument for a general deluge, is a complete refutation of such a doctrine. Accordingly, Dr. Buckland and others who had "too hastily" followed the opinions of Cuvier on this subject, have recently favoured the public with a solemn recantation of their geological principles, as described in their former publications. Now, we hope that these gentlemen will not be angry, if some more unlettered genius, who is an ardent admirer of their *quondam* "uncontrovertible arguments," should hesitate to follow their "hasty" change of sentiment, at least until another ten years shall have passed away; lest he should then have to make a second recantation, by reason of some new facts soon to be discovered; and again require to shift his grounds, or fall back upon the old theory of Cuvier. Especially since many philosophers, who are now searching for "the root of the matter," even under Marchison's Silurian mountains, are said to be on the *qui vive* for a brilliant *denouement*; perhaps, a prudent man may think it a mark of wisdom to withhold his decision until the present investigations shall have been happily completed.

Moses, too, has changed his position in the sight of modern geologists. A short time ago his description of the deluge was held to be admirably consistent and perfectly philosophical. So long as Neptune kept possession of the great caverns of the deep, he had plenty of water to cover a few primitive mountains: but when Pluto usurped the whole interior of the globe, a new shift had to be found for the flood of Moses. Declaiming against the infidelity of Cuvier's "six days," and shocked at so violent a perversion of scriptural language, cosmological divines now earnestly maintain the veracity of the sacred historian on this point; but they good-naturedly allow him a little latitude of expression in his account of Noah's ark and the subsequent desolation. Whilst the history of Moses is confined to *terra firma*, so long he is deemed to be perfectly correct; nor has his narrative any ambiguity of figure in its verbiage; but when he launches upon the flood and gets out to sea, it must not be expected that his observations should be noted with the same exactness. He had a most awkward vessel and an unruly crew

to manage, which, in connexion with his sailing upon a new ocean, will easily account for a few inadvertencies in his log-book.

Along with the reign of Neptune, the foundation of his strata has undergone a complete change. Part of the primitive rocks being now assigned to Pluto, the first-born of the former is declared to be the youngest child of the latter. For, though fire and water appear themselves to have been twins, and though the last-mentioned has been much more prolific than his fellow, yet his strata have been of a weaker kind; so that the crystalline constitution of granite is supposed clearly to designate the offspring of the fire-god. Baron Cuvier's skill in comparative anatomy appears to have failed him when dissecting the sturdy muscles of mother earth. In compliment to him, however, the appellation of *primitive*, which he gave to his foster-child, has not been taken away; but the surname of *unstratified* has been appended, in order to point out the changeling.

What next will come, time—for which geologists are incessantly calling—time only can show. Perhaps there is now some Scotchman or Welshman unobservedly digging under the Silurian strata, who may suddenly bring to light some hidden spell which shall confound the “father of English Geology,” and dissipate the theories of the fourth decade of the nineteenth century.

REDUCTIO AD ABSURDUM.

WHILST biblical critics have so subtle and changeable an adversary to contend with, no wonder that they are constantly foiled, and that all the world exclaims against the impotency of their arguments. Geologists agree in declaring that they do not intend to attack the Bible, but only to oppose its mode of interpretation. They would all be satisfied with a few concessions on the part of the biblicist, and each wonders why some petty matters cannot be given up; forgetting the variety of their several demands, and how fearful an inroad would be made into the truth of scripture, were even a little conceded to each of the demurrers. The best plan is to keep to the present text, until geologists can agree upon the nature, and extent of their requirements: then a parley may perhaps take place, and the

accounts be properly examined and mutually adjusted. It is not the Christian divines, but the philosophers, who disagree about the meaning of Moses ; and they are as much at variance amongst themselves as with the common enemy.

Some of the defenders of the faith have unfortunately fallen into a similar error with the writers whom they have opposed. Instead of taking advantage of the disordered ranks of their adversaries, and helping one party to destroy another until they should all fall together, they have exposed themselves to the shafts of every detachment. By giving their own interpretation of the manner in which the world was created, the deluge brought on, and the earth re-peopled after its desolations, they have unwarily obtruded themselves upon the critical acumen of the cosmologist ; and an *incomplete* exposition is made to appear in the light of an objectionable system. Should it then be asked, if a man has no right to explain the meaning of the holy scriptures ; we reply, that some things are far beyond the powers of the human intellect to reach, or mortal genius to penetrate. Facts may be recorded which we receive as simple facts ; the reason and manner of which we cannot hope to comprehend. Reason will not serve as a teacher in matters that are beyond its ability : so that, though we may depend upon its decision to a certain extent, yet there is a point where its guidance must fail, unless we should clothe it with the attribute of infinity. Eye-sight gives us information of our neighbourhood and the surrounding objects ; but its discernment eventually ceases, and an impenetrable obscurity rests upon the minutiae of a distant landscape. The telescope remedies this defect to a certain extent, and furnishes many details which the ocular observer could not have perceived ; yet it also has its limits of action, both from the rotundity of the earth, and the distance of the heavenly bodies, as well as from a want of sufficient light thrown upon the objects of observation. So it is with the province of our reasoning faculty, which, being limited in its own nature, should confine itself to those subjects where a *sufficiency of data* is afforded for its ground of operation.

It is quite true that we have learned something about the world, and have dug a little below its outer surface, and given names to compound substances there discovered, also to some of the unknown materials of which they are thought to be composed ; but what is all this to the creation of a planet ? A child may build up or pull down a grotto of oyster-shells ; but the

construction of a palace would be far beyond his diminutive powers. So a chemist may dissolve some of the simple salts in suitable liquids, and again precipitate them into their crystalline form : but this is a very different kind of attempt from that of rearing mountains of granite, or dissolving the elements of our globe. Never was a wiser hint given to geological theorists than that of the learned but modest Chalmers : " We have no experience in the creation of worlds." When we shall once have been present at so glorious a display of might and wisdom, we shall be better able to explain the manner of its developement.

In every science, properly so called, there is a general harmony of opinion amongst those who are acquainted with its grand principles. Proceeding upon the Baconian method of reasoning from ascertained facts, and tracing them up to common causes or unvarying modes of action, every proposition which is laid down as a fundamental rule may be tested by actual experiment. Indeed, a failure in similar results on a single occasion is deemed sufficient to throw a well-founded suspicion upon that part of the system where the incongruity has occurred. No maxim can be received as truth in any science, where the facts of the case will not accord with the *principia*. The latter is not expected to precede the former ; but the theory is supposed to follow a series of experiments, and to be grounded upon such certain data as to be altogether incontrovertible. This constitutes the difference between recent and ancient philosophy ; and it is this clear method of procedure which has conducted to the brilliant discoveries of modern science. In former ages, a plausible conjecture was first brought forth from the prolific brain of an ingenious theorist, and an attempt was then made to explain contingent circumstances so as to suit the nature of the favourite scheme. Every thing which did not seem to agree with the darling hypothesis was forced into compliance, or was altogether discarded ; whilst far-fetched examples were introduced to give it a delusive support. Admirers were soon found to minister help to the new system, and solid reason gave up her place to the more gay and fascinating fiction. But other philosophers followed, with cherished fancies of their own ; and it became an object with them to expose the fallacy of their predecessors' schemes, that theirs might gain the wished-for place in popular favour. Nor is there any vagary, however wild, which may not find some specious argument in its defence. In this manner, one theory followed another in endless succession, without any

real advancement in science being gained ; for the new facts which were elicited only served to supplant the old, leaving the garden of knowledge as bare and disorderly as ever. A fresh light shone upon philosophy, when men learned first to gather and examine the materials of a subject, then to arrange them in a natural order of similarity or relationship, and finally to construct a system on this solid foundation of experience, with a superstructure of well-tested facts and logical arguments. An ancient sage could never be sure of being right, however boldly he might propound his dogmas, or however confident he might feel in his powers of reasoning ; for he had not established the basis of his scheme, and could not, therefore, afford any proof of its dependent parts. Arithmetic and geometry formed splendid exceptions to the usages of olden philosophy ; and their elements still remain in primitive glory, untouched by the ruthless hand of time,—stable monuments of human genius directed by the laws of truth,—like a firm beacon in the midst of the ocean, round which the waves and tempests play their rude gambols, without moving a single stone by their most tumultuous efforts ; and the whole fabric, systematically connected together, must stand inviolate, whilst the sea of time has any light of science to illumine its darkness and guide the practical navigator along its dangerous coasts.

Cosmogonists would take us back to the ancient method of building upon theory instead of experiment : and we wonder that some able mathematicians have in this instance abandoned the first principles of their favourite study, by relinquishing the only modes of propounding truth, which are now thought worthy of a philosopher. Whilst they complain that the public hesitates to adopt their systems, as if it doubted the skill displayed in their researches, and the sincerity of their statements, they seem to forget that we may acknowledge all their geological *facts* without receiving their subsequent lucubrations. We credit the truth of their description, as far as it goes, of the nature and properties of the earth's strata ; and, upon examination, we find that our confidence in their veracity has not been misplaced. But the same men may be excellent investigators, and very bad theorists. The facts adduced from actual observation may all be rightly laid down ; whilst a system built upon these facts may be thought deficient in its mode of proof. Logic and nature are different studies ; so that an adept in the latter may be a mere novice in the former. A learned Brahmin is well acquainted

with the heavenly bodies, in so far as the unaided eye of man can discern them; he understands their particular places and relative positions; he knows their phases, and calculates their eclipses; yet he is ignorant of the very elements of true astronomy, supposing the earth to stand upon the back of a tortoise, and the sun to move round it in diurnal revolutions. Here is the difference between the acquirement of certain *facts*, and a knowledge of scientific *principles*. We admire the elaborate skill of the patient Hindoo; but we refuse to assent to his philosophy. Although it may seem to account for many phenomena of the heavenly bodies, it is evidently inconsistent with the general scheme. Upon comparing it with several items of observation, the result proves satisfactory; but in other cases, it is deficient or contradictory, and the theory is therefore self-destructive. The principles of a true science must solve any problem connected with it, and answer every equation where sufficient data have been given.

Thus it is with the gravitation of matter. Experiments without number have been made, both respecting earth and heaven, and they have always been found to agree with the principles of Newtonian astronomy. Gravitation accounts for every motion of celestial, terrestrial, and atmospheric bodies. Had it failed to harmonize with any plainly-observed phenomena, it would have been instantly repudiated as a general law of physics. There is no discrepancy between men of science on this subject, or on any of the truths evidently drawn from its principles; for every mathematician may *prove* their consistency by a series of calculations. Astronomers may still differ about the mountains of the moon, the atmosphere of the sun, the nature of comets, and the inhabitants of those far-distant worlds; for these are deemed mere speculations, extraneous to the actual science, and forming an agreeable pastime in the prosecution of severer studies.

But the cosmogonist pursues the Brahminical mode of philosophy. He has formed a fanciful theory, corresponding with a few features of observation, but incongruous with other parts of the system, and the relations of which do not admit of a proof by the test of experiment. When, therefore, he leaves the plain ground of logical argument to travel in the airy regions of speculation, we refuse to follow his hazardous career, or to leave our accustomed paths of solid reasoning. He ought to have been content with ranging in the present world, which is large enough for the play of his genius; or at least to have dug a little deeper

into the earth before he ventured into unknown dispensations. Unable, *experimentally*, to account for any thing, he takes it for granted that he can define all things. Instead of pursuing his observations upon *terra firma*, where he could render a plain account of his proceedings, so that we might trace the route of his scientific researches; he gives an imaginative description of the phenomena of earth's interior structure, where no mortal has hitherto adventured: yet he expects us to receive his lucubrations as a faithful picture of that mysterious country, without furnishing a journal of his travels, or even pointing out a feasible way by which he could have reached those dreary regions.

Geometricians sometimes employ a curious manner of proof, which will answer our purpose on this occasion. When they cannot demonstrate the truth of a problem by taking another consecutive step on their wonted line of argument, they have recourse to what is technically called the *reductio ad absurdum*; whereby they show that any other position than that which they have laid down must be wrong, and consequently their own must be right. By tracing out every erroneous hypothesis, and *reducing it to an absurdity*, they establish the validity of their own proposition. Since one quantity must either agree or disagree with another, they prove its concurrence with a certain rule, by showing that any other supposition is untenable; and, therefore, since the two cannot differ, they must be similar. We think that the *reductio ad absurdum* will supply our want of positive proof in reasoning with cosmogonists. For we do not presume to imagine, that even if the Almighty had taken pains to instruct us in his method of creating worlds, we should have been able to understand the process, on account of our very limited faculties; nor do we profess to comprehend the summary outline afforded by Moses in the book of Genesis. Here we would remark upon the futility of those divines who have met geologists upon their own ground, in reasoning about a central fire, the bottom of the ocean, and the nature of a primeval chaos. We can find no footing in such awkward places; and we decline combating where we cannot stand. But we can rest upon the narrative of Scripture, and prove that it is solid truth, by overthrowing every antagonist who takes a more slippery position: we can show that we are right, by demonstrating that they are all in the wrong: unable and unwilling to establish any separate system of our own, we shall prove that Moses is correct, by the authorized method of *reductio ad absurdum*.

NEPTUNISTS.

SOME years ago, the poetical idea of Ovid, that our world was once a chaos or confused mixture of earth and water, prevailed to a considerable extent amongst every class of philosophers; and, as it seems to be generally entertained by school-boys, it probably is the current opinion of the mass of our population. Scriptural commentators, for want of a better explanation, took up the same view: so that, upon reading the first verses of the Bible with this pre-conceived notion, the phrase "without form and void" was supposed to mean an earthy paste such as the Roman poet had described; and Ovid's *Metamorphosis* was received as a pretty good version of real history. Werner adopted it for the ground-work of his geological system. He conjectured that all the particles of the earth's surface were once held in an aqueous solution; but that they were eventually united by chemical attraction, and precipitated by gravitation. When the primary rocks had been thus deposited, the water retired until they were consolidated. It again returned to form a new series; and this process was repeated at long intervals, accompanied by sundry catastrophes, until the whole strata were completed. His conjectures were readily entertained by other geologists, who thought to have hereby discovered the great agent by which the world was fashioned. The water thus set at liberty by the consolidation of the land, was supposed to have retired into beds of the ocean, and into vast caverns of the earth; but at the deluge they again burst forth, and overwhelmed all living creatures. Some eminent naturalists embraced this scheme, and the high name of Cuvier seemed for a time to frown down all opposition. Sundry appearances were adduced in support of the theory; and, when we were boys studying mineralogy, we gladly surrendered the primitive empire of our globe to the fabled god of the waters.

The Wernerian system suited both infidels and Christians. The former perceived how a fortuitous concourse of atoms in the primeval chaos, could be rightly moulded by the simple laws of attraction and chemical crystallization, without any need of an interposing Deity. The latter had only to imagine the "six days" of Moses to be prophetic periods of one thousand

years each, so as to afford a little time for the aqueous deposition: then Cuvier and Moses would mutually explain and corroborate each other. But when this specious theory was thoroughly investigated, and “weighed in the balance” of science, it was found to be singularly “wanting.”

Astronomy has demonstrated that the great mass of our globe must be composed of heavy materials, about twice the density of granite. So, according to the laws of gravitation, the weighty materials of a fluid body would settle in the interior; the lighter substances would be next arranged in successive layers, according to their specific gravity; and the water would necessarily occupy the surface, after all the solid particles had subsided. In this case there could have been no mountains, springs, or rivers; which is directly opposed to the facts of the case and the declarations of Scripture.

Again, on the above plan, there could have been no vast hollows filled with water underneath the ground; for mere water would have been lighter than the pasty chaos, and yet it would have been supposed to settle in the interior, which is incompatible with the nature of fluids, and the laws of specific gravity.

To hold all the solid parts of our dense planet in an aqueous solution, so as to allow them a free motion for the purpose of crystallization, would have required an immense volume of water, such as we shrink from contemplating. Our present seas would probably not have sufficed to moisten the entire matter of the globe. Should it be conjectured that much of the ancient fluid has evaporated, the difficulty still remains—for where has it gone? The force of gravitation would prevent its leaving the neighbourhood of our globe.

Here we might ask a question which refers to more systems than that of Werner:—Can all minerals be dissolved and held in aqueous solution? We think not: and until this be proved by practical chemistry, those geological theories which include such a supposition must be regarded as ingenious trifling. Fire has melted some minerals, acids have decomposed others, and a few salts can be dissolved in water: but what are these, when compared with mountains of granite, gneiss, or mica-slate? Could *they* be solved in water? Or, granting this possible, and supposing that we could obtain a solution of felspar, quartz, and mica; would they be precipitated and crystallized in the form of *granite* or of *gneiss*? Decidedly not; for, if

homogeneous particles attract one another, then the component parts would form separate masses of a similar kind—such as we perceive in beds and strata of solid quartz. Besides, different substances have different gravities; and we cannot conceive how felspar, quartz, and mica should be held together in a liquid, until their particular crystallizations had taken place and united with one another.

We shall find other chemical curiosities in this system of aqueous deposition. *First*, with regard to the formation of *primary* strata, we discover the same materials to be made up into a variety of stratified and unstratified rocks, disposed upon each other in regular order, (with sundry exceptions,) instead of a vast mass of homogeneous rock, as we should expect to find in a chemical precipitation, where the particles had united. Gneiss has the same constituents as granite: why did it not form one mass with the former? How came the granite to harden before the deposition of gneiss commenced? How were the laws of crystallization changed in the mean time? Mica-slate is composed of quartz and mica, like the foregoing; and it occasionally contains felspar in irregular masses. How did this strange accident take place in nature's operations, by the felspar becoming so very unaccommodating as not to coalesce with its former friends? On other occasions, felspar and quartz were so very fickle in their manœuvres, that they must needs compose a granulous porphyry! Clay-slate and hornblende seem to have been quite as capricious in their associations; whilst quartz, in order to show its perfect independence, is sometimes pleased to dwell by itself in large rocks or beds amongst other primitive strata. Really, if such curious formations took place according to the laws of physics, our chemists are yet unacquainted with the first principles of their science. Or, if the mode of nature's operation be now wholly changed, we need not hazard a conjecture upon her primeval manner of workmanship.

The affair is quite as marvellous when we consider the *transition* and *secondary* rocks, which are supposed to have originated in subsequent eras. It would, indeed, be hard to imagine where the waters retired after the primitive layers had been arranged, and how they returned laden with the material of new strata. But supposing this to have occurred, we should naturally expect the more recent depositions to be lying in a horizontal posture; whilst, in reality, we find them lining the sides of almost perpendicular mountains! The ocean, very good-naturedly, again

retired for a season, and left the rocky crust of the earth "prepared for supporting animal and vegetable life!" The naturalist would wonder how the creatures got there, and the agriculturist would make inquiry about the origin and nature of the soil: but such difficulties are mere trifles in the way of modern geologists; they can easily overcome them by the all-wonderful "powers of nature."

This third calm, however, was not destined to be of everlasting continuance. The treacherous seas were not disposed to leave the anti-Mosaic vegetables and animals to enjoy their rocky soil. Another catastrophe was at hand; and the mighty ocean began to sport with her former work,—ascending the highest mountains, and breaking their crust into shreds and pieces, which she very wisely mixed with decayed vegetable and animal matter, and made them into alluvial rocks or fertile soil, as best pleased her fairy fancy. With great consideration, she also bethought herself of man's future necessities, and reserved a considerable portion of the forest *debris* in order to construct our coal-formations, which she also laid in a slanting position. It would be difficult to imagine where she obtained the metallic ores; (for as some of these are very heavy, we should have supposed them to have been first precipitated, and to have lain in enormous masses in the heart of the globe;) but having procured them in some undiscoverable manner, she fused and carried them aloft to the summit of the mountains; then, boring holes in the hardest rocks, she filtered them through the open fissures. How those massive veins of porphyry, granite, trap, and serpentine, which perforate solid strata of different orders, and form caps on the summit of elevated regions, arrived at their strange destination, cannot now be ascertained; but they also are thought to have been poured from above by the prolific and all-accommodating waters. Volcanic productions, which, though of inconsiderable bulk, are found traversing mountains of very hard stone, prove a more difficult phenomenon to the Wernerian speculator; especially when he considers how nearly they are allied to the floetz trap-rocks, to basalt, trachyte, and even to igneous porphyry!

PLUTONISTS.

SOME philosophers, perceiving the great difficulties under which the Neptunian system labours, have recourse to another agency in the formation of our world. They allow, indeed, the action of water in depositing strata at the bottom of the ocean ; but they suppose them to have been consolidated, crystallized, and upraised by means of *fire*. This scheme seems to be the prevailing one of the present day ; but it involves some very extravagant and contradictory opinions.

The first difficulty refers to the materials or "*debris* of a former world." What was the structure of that world, and how was it wrecked ? Again, as to the central fire—when and where did it originate ? How did it get to the earth's centre ? How is it fed ? Or, if mere heat, how has it been kept up for so long a time ? Concerning these points, Plutonians are at issue amongst themselves ; and we might very properly leave them alone until they shall have agreed upon the first principles of their theory. Mr. Playfair and his followers, down to Dr. Pye Smith, suppose that our globe was once intensely hot ; that the surface has gradually cooled, and been formed into rocks ; whilst the interior is still a mass of glowing liquid, by the unequal pressure upon which, frequent outbreaks or undulations take place, and volcanoes or earthquakes are consequently produced. But since this fire cannot be fed from any internal source, nor is there any visible inlet by which fuel is supplied, we should have thought that it would have become extinct long ago. To believe that there is a furnace of such immense size, thirty miles under our feet, whilst the ground is often frozen up with cold, and covered with snow, is in absolute contradiction to all the known usages of heat. This fire, moreover, is so amazingly fervid, as to have fused the lower strata, thereby destroying the organic remains which they are thought to have contained. But if the globe was once a ball of liquid fire, whence came the matter for fusing ? "No," says Mr. Playfair, "the debris of a former world were left upon the surface, and the central heat has ascended as far as the lower strata and fused them, whilst it has not yet reached the outer layers." Then the fire must have been mounting upwards during the lapse of past ages, and, consequently, have been increasing instead of diminishing in intensity ; which destroys the idea of an external cooling. And it is

strange, that, when it got up so far, it did not contrive to ascend a little higher, and take possession of the whole planet.

Dr. Pye Smith, like other Plutonians, seriously informs us, that granite was amongst the last-formed rocks; yet, when speaking of gneiss, he says, "This is precisely that state which would be produced by an action upon the granitic surface, whether unaltered or somewhat disintegrated, of wearing off, removal, rolling about, diffusion in water, subsiding by its own weight, settlement at the bottom, and final disposition by the straight direction of a current." Strange, indeed! Gneiss is made out of disintegrated granite, yet granite is the most recent of all mineral substances! Gneiss is the most ancient of stratified rocks, lying at the bottom of regular strata, yet it originated from the debris of granite, which came last in the mineral formation! We should have thought that, in common consistency, the Huttonians would have fused the under strata of gneiss in order to compose the granite; but, in this case, they could not have accounted for the stratified rocks, without allowing a previous Neptunian deposition. Their theory involves a palpable contradiction.

Dr. Smith proceeds: "In a word, it is that state which those materials would necessarily acquire, in the way of being worn and arranged by water working upon them through a long space of time; also being farther acted upon by a heat transmitted from below." Is it really so? Has the Doctor ever picked up a piece of water-worn granite, and compared it with those beautiful specimens of shining gneiss which we have seen; and will he say, that the latter was composed out of the dull debris of the former? He tells us what "would necessarily" happen, with the same boldness of affirmation as if he had been present at the creation of a primitive rock; but we suspect that he knows nothing about the matter. Arguing upon his skill in manufacturing minerals, he proceeds to calculate the time necessary for making huge mountains of gneiss out of granitic remains! This process was effected by the agency of rivers and floods, which broke down the granular substances, and carried their particles into the bed of an ocean, where they were hot-pressed between the water above and fire below, being made very warm, yet not altogether melted like the more crystalline rocks! Nor need we wonder at their never becoming liquefied, when a *cold* ocean was poured over them: the marvel is, how they became *sufficiently* heated in so refrigerating a situation.

But who ever heard of perfect crystallization taking place without a solution of particles? Does fire crystallize stones? Does it not render them opaque and earthy. If Dr. Smith were able to melt gneiss in a flame, would he expect it to cool into granite?

Next in order are "the Cambrian and Cumbrian series; and their mode of formation is proved, by the most striking character, to have been the same as that of gneiss, modified by an increase and progressive composition of the materials." We acknowledge no such "proof," till it has been ascertained by experiment. We have seen some of the mountains which Dr. Smith describes; and we had no more idea of their being constructed out of gneiss, than we had of a human head being made out of an old neck and shoulders, because it is placed in the next higher region, and most of the materials are homogeneous. If geologists still inquire, "Whence came the gneiss and slate?" we ask, Whence came the skull and hair?

Again: there are large beds of crystalline rocks contained in the stratified. Primary limestone in the midst of mica-slate, quartz-rock and conglomerates amongst clay-slate; there are distinct veins of granite pervading great mountains of the same mineral; there are porphyritic, serpentine, and trap veins perforating all the series; and soft minerals are found running through the hardest rocks. It is childish to account for such wonderful phenomena by supposing fissures to have been casually made, and the melted matter to have been poured in; for still the questions would arise: Whence came that matter? Who filtered it through? and how could such veins intersect one another so neatly? Or, who ever heard of volcanic fissures in a mountain, unaccompanied with great rents? These veins, however, seem as if they had been bored with an awl through the centre of the firmest beds. Besides, some of them run in such a direction as to be impracticable on the Huttonian hypothesis.

Having already found so many contradictions or impossibilities in this system, we would almost pass over another objection, though it also lies at the very root of the matter. We know that different substances require different solvent powers; and even those which are solved by the same agency undergo that solution at different degrees of temperature. But the Plutonian would fuse minerals, metals, and salts by the same fire; forgetting that a strong heat would decompose those crystals which water would dissolve; and, when once decomposed, how could

they be renewed? Are felspar, quartz, and mica all dissolvable by the same heat, so that one of them would not lose its pristine qualities before the others were fused? And would all admit of an easy re-composition? Or, supposing them to be only disintegrated by water, would mere hot-pressure amalgamate them into a hard rock like two pieces of metal joined by the blow-pipe? Would not such a fervid heat make the very ocean to boil? And what would become of metallic ores in such a furnace? Would they not have been fused into metals, and saved us the trouble of smelting?

In fact, the scheme will not bear even a slight investigation. Before Huttonians can hope to be credited in their marvellous speculations, they must exhibit a practical proof of their fancied mode of operation, at least on a small scale; by solving or decomposing a few minerals, and then precipitating, crystallizing, and agglutinating them by heat, according to their proper orders, and their several stratified appearances.

We shall quote some paragraphs from two published letters of Sir John Herschel, to show the pleasantry with which he treats the whole subject; (though Mr. Babbage seems to take it for serious truth;) only observing, that if philosophers may thus smile at each other's geological schemes, we may surely laugh at them all.

"Now for a bit of theory. Has it ever occurred to you to speculate upon the probable effect of the transfer of pressure? It has always been my greatest difficulty in Geology to find a *primum mobile* for the volcano, taken as a general, not a local, phenomenon. Davy's speculations about the oxidation of the alkaline metals seems to me a mere chemical dream. Poulet Scrope's notion of solid rocks flashing out into lava and vapour, *on removal of pressure*, and your statement of the probable cause of volcanic eruptions, appear to me wanting. The question stares us in the face, How came the gases to be so condensed? Why did they submit to be urged into liquefaction? If they were not originally elastic, but have become so by subterranean heat, whence came the heat? *and why did it come?* How came the pressure to be removed, or what caused the crack?" &c. &c. Sir John then proposes his own "speculation." "I would observe that a central heat may or may not exist for our purposes. And it seems to be a demonstrated fact, that *temperature does*, in all parts of the earth's surface yet examined, increase in going down towards the centre, in what I almost feel disposed to

call a *frightfully* rapid progression : and though that rapidity may cease, and the progression even take a contrary direction long before we reach the centre, (as it might do, for instance, had the earth, originally cold, been, as Poisson supposes, kept for a few billions or trillions of years, in a firmament full of burning suns, besetting every outlet of heat, and then launched on our cooler milky way,) still, as all we want is no more than a heat sufficient to melt silix, &c., I do not think we need trouble ourselves with any inquiries of the sort, but take it for granted, that a very moderate plunge downwards, in proportion to the earth's radius, will do all we want. Nay, the internal heat may be locally unequal; that is, great in Europe and Asia, small under America; as it would, for example, if, when roasting at Poisson's sun-fire, the great jack of the universe had stood still, and allowed one side of our terraqueous joint to scorch, and the other to remain underdone : a hint to those who are on the look-out for a cause (if any such there be) for the poles of maximum cold, and the general inferior temperature of the American climate, from end to end of that continent."

Had all geologists regarded their own and their neighbours' theories with the same good-humour as Sir John Herschel, we should have found no fault with their most extravagant fancies; for the wilder they had been, the more should we have been entertained with their perusal.

But since the doctrine of a central fire is repudiated by most of our *natural philosophers*, as being utterly inconsistent with the *known laws* of physics respecting *heat*, we shall leave our speculative Plutonians to settle this important point with the experimental school of Dr. Black, Professor Leslie, or Dr. Thomson.

NEBULARISTS.

WE should not have made any remarks upon the *Nebular hypothesis*, regarding it only as a playful fiction of Laplace, had not some late theorists been attempting to establish it in a serious manner. Dr. Pye Smith informs us that it is gaining ground amongst geologists,—which certainly is no great inducement for us to put confidence in their logical powers. We shall therefore adduce it as an example of how very far a practical mineralogist

may be wanting in the habits of inductive philosophy: so that, whilst we give him full credit for his indefatigable researches, we may place no reliance on his ability to construct theories, or on his skill in creating worlds. The Nebular hypothesis has been lucidly described by an eminent writer in the following terms:—“Laplace conjectures that in the original condition of the solar system, the sun revolved upon his axis, surrounded by an atmosphere which, in virtue of excessive heat, extended far beyond the orbits of all the planets, as yet having no existence. The heat gradually diminished; and as the solar atmosphere contracted by cooling, the rapidity of its rotation increased by the laws of rotatory motion, and an exterior zone of vapour was detached from the rest, the central attraction being no longer able to overcome the increased centrifugal force. This zone of vapour might in some instances retain its form, as we see it in Saturn’s ring; but more usually the ring of vapour would break into several masses, and these would generally coalesce into one mass, which would revolve about the sun. Such portions of the solar atmosphere, abandoned successively at different distances, would form ‘planets in the state of vapour.’ These masses of vapour, it appears from mechanical considerations, would have each its rotatory motion; and as the cooling of the vapour still went on, would each produce a planet, which might have satellites or rings, formed from the planet in the same manner as the planet was formed from the atmosphere of the sun.”

Now we should think, that if the sun be the centre of light and heat, he would not be always parting with a portion of these genial influences: if so, he must continue to cool, until he shall be no longer a sun. And we wonder that this has not taken place long ago. However, since his luminous atmosphere has already contracted from “far beyond” the planet Herschel, which is nearly 2,000,000,000 of miles distance; and since Mercury is not 37,000,000 of miles from his body, we may expect that the next *throw-off* will plunge our system into utter darkness. Indeed, this must be the case, if it shall average the former effects, by which it originated eleven planets and Saturn’s ring. And since old women tell us that the seasons were much milder in their youth than they are now, this awful crisis may speedily be expected to arrive; especially as it is so very long a time since Mercury was produced. In vain philosophers attempt to convince us of the stability of our planetary system; for since twelve accidents of this nature have already occurred, there is

every probability that the thirteenth will happen: and, when we remember that the planets also have already parted with their luminous atmosphere, once obtained from the sun, the probability of his becoming opaque is vastly increased; nay, according to Laplace's own "calculation of chances," we may regard it as a moral certainty, and may be in yearly expectation of this awful occurrence. We wish that some of those astronomers who have so roused our apprehensions, would enter into a minute calculation of the rate at which this cooling process takes place, that we may know if the sun's light will continue during our lifetime;—which they might easily do, by comparing the nebulosity of Mercury with that of Venus and the earth. Geologists tell us that before the time of Moses, the earth's temperature must have been much greater than in the present day,—an inference which is drawn from the tropical nature of organic remains now found in temperate regions. So that, either Mercury was not then "thrown off" from the sun, or else his cooling process has gone forward at so fearful a rate as quite to establish the old women's report; and a tremendous catastrophe is approaching, accompanied with a total destruction of the world's inhabitants, both vegetable and animal, in a chaos of utter darkness and frigidity.

Under these considerations, it is some consolation to take refuge in the absurdity of the hypothesis. Was this weighty world formed out of a luminous vapour? Then, why is it not still luminous? Are solids made out of vaporous and luminous particles? How came there to be water, which could not have existed, even in a state of vapour, in so tremendous a heat as that contemplated by Laplace? How did the globe cool, and whither has the heat gone? If solid particles formed the first nucleus, they must now be in the centre, and all idea of an internal fire must be abandoned;—how, then, will Dr. Pye Smith manufacture his world? Would not so great a heat have reduced every substance to white ashes, instead of modelling it into so beauteous a world?

Let us consider the foundation of this wild theory, and the reason assigned by its originator. "Such is in fact the first state of the nebulae which Herschel carefully observed by means of his powerful telescopes. He traced the progress of condensation, not indeed on one nebula, (for this progress can only become perceptible to us in the course of centuries,) but in the assembly of nebulae; much in the same manner as in a large forest we may trace the growth of trees among the examples of different ages

which stand side by side. He saw in the first place the nebulous matter dispersed in patches, in the different parts of the sky. He saw in some of these patches this matter feebly condensed round one or more faint nuclei. In other nebulae, these nuclei were brighter in proportion to the surrounding nebulosity; when, by a farther condensation, the atmosphere of each nucleus becomes separate from the others, the result is multiple nebulous stars, formed by brilliant nuclei very near each other, and each surrounded by an atmosphere: sometimes the nebulous matter condensing in a uniform manner has produced nebulous systems which are called *planetary*. Finally, a still greater degree of condensation transforms all these nebulous systems into stars. The nebulae, classed according to this philosophical view, indicate with extreme probability their future transformation into stars, and the anterior nebulous condition of the stars which now exist."

Here is a fresh subject of alarm. If Herschel could so distinctly trace the matter of these nuclei, they must be very close to our earth, for the nearest star appears a mere point even through the most powerful telescope: consequently a new sun may soon be formed in our neighbourhood, which shall wholly destroy the planetary system. We do not, however, allow that stars and planets are of the same composition: and if the above be the usual mode of originating suns, it may have nothing to do with manufacturing planets. We might relate Herschel's discovery (if such it be) in a very different manner, by assuming an opposite hypothesis. For instance: the whole *materiel* out of which the nebulous theory has originated, is to this effect: "He saw some dark spots surrounded with a luminous atmosphere of different intensities." How natural is such a variety, and how analogous to all the operations of the Creator! Laplace's figure of *the trees of the forest* is not admissible as an argument: it only shows that though he was an excellent astronomer, he was a poor logician; and we wonder not that Bonaparte found him to be a wretched Minister of State. The similarity existing between two objects must first be proved before any argument can be drawn from their homogeneity. But is there any point of resemblance between a luminous cloud and our opaque globe? Surely, not half so much as between a monkey and a man;—whence Lord Monboddoo argued that the human species was derived from an oran-outang. We readily grant, that a young oak will in due time become a large one; but we do not admit that a

bramble will ever grow into a beech tree. In the same way, the French philosopher might have attempted to prove, that two or three oysters will be condensed into a crab, and that several of these will unite to form a tortoise.

Finally, the gradual refrigeration of the earth (and, consequently, the nebular hypothesis) has been shown impossible by Laplace himself, in one of his forgetful moments; for he asserts that had a cooling of the globe taken place, even to a very slight degree, it must have become sufficiently contracted in bulk to make an appreciable difference in the shortness of the day, which is proved from scientific records not to have been the case during the last two thousand years. Since this is a matter of fact, it follows, that both the Plutonians and Nebularists *must be wrong* in their systems; or else, that the laws of heat have undergone a complete change; under which supposition, no ground of argument remains, and one theory respecting former dispensations is quite as good as another.

We once thought, that the "Arabian Nights' Entertainments" could not be surpassed as a specimen of fictitious extravagance: but we were mistaken,—for the Nebular hypothesis leaves it far behind. The one built fairy castles, the other builds fairy worlds.

Having taken a general view of the principal geological schemes, and having examined them upon the ground of their own merits, we have found that they will not stand the test of a logical or scientific scrutiny. They not only oppose one another in every essential point, but they are contradictory in themselves, and are repugnant to the well-known principles of experimental philosophy. We believe them also to be at variance with the records of Scripture, with the analogy of nature, and with many ascertained facts of natural history and geognosy. For the sake of perspicuity, we shall arrange our remarks on these points under the subjects of creation, the deluge, the deposition of strata, and the difference of species in organic remains.

THE SIX DAYS OF CREATION.

WHEN we peruse the Mosaical account of the origin of our system, we are struck with its wonderful ease and simplicity. It is concise; yet it tells us all that we require to know, in order

to worship the heavenly Artificer. Its very brevity seems to forbid the prying eye of vain curiosity, and to divert man's attention from that mysterious transaction to a class of subjects which he may better hope to understand. We know that the greatest human minds have been engaged for six thousand years in searching out and describing the works of creation; but whilst every addition to our knowledge extends the catalogue of these wonders, every advancement in science points out a still wider range for the walks of philosophy. If man, then, cannot yet inform us of all that has been made, can he expect to tell us *how* it was done? Should the geologist inquire if we may not lawfully speculate upon the mode in which *a part* of our system was primarily modelled, we would reply, that such an inquiry does not appear consonant with wisdom; for if all nature be one symmetrical whole, reason suggests that it was made *at once*, for a specific object, by a great master-mind.

This analogy of nature agrees with the records of Scripture. Moses relates, that God employed six days in constructing the world, having a wise intention in occupying that particular space of time. From the perfect facility with which He performed his work, it is evident that time was no object with Him, as it is with cosmogonists. His operations were not slowly progressive, like those of man: they were such as might be expected from Omnipotence. When he said, "Let it be," *it was*. This summary mode of creation is beautifully described in other parts of the Bible. "By the word of the Lord were the heavens made, and all the host of them by the breath of his mouth: for He spake, and it was done; He commanded, and it stood fast." (Psalm xxxiii. 6, 9.) "Through faith we understand that the worlds were formed by the word of God, so that things which are seen were not made of things which do appear." (Heb. xi. 3.)

That the six days employed in the creation were natural days, like those at present enjoyed, is evident from the reason assigned by the inspired penman: "God blessed the seventh day, and sanctified it; because that in it he had rested from all his work which God created and made." (Gen. ii. 3; Exod. xx. 11.) It would appear, therefore, that in order to impress mankind with the duty of resting from ordinary toil on one day out of seven, Deity set a memorable example in his creating process. That such a rest is salutary, and even necessary, for man and the beasts employed by him, is attested by the most eminent natural, moral, and economic philosophers: so that nature agrees

with Scripture on this important point. But how could such a *reason* for the sabbath be assigned with any shadow of integrity, if the world was not thus created, and if the six days' work really means nothing more than some of the regular operations of nature, similar to those which have been occurring for twenty thousand ages? A summary and distinctive creation, performed within a week, must be admitted by every geologist who fears the Lord of the sabbath.

This prepares our way for discussing the subject of a *gradual process* of formation, which involves several questions. Did the Almighty first make the crude materials of our globe, and after a great while mould them into their present state? Or, did He create and fashion them at once? In the first case, did a long interval elapse between his making chaos, and his putting man into a gradually-prepared habitation? In the latter event, was the whole world, as now fitted up, produced about six thousand years ago?

We would refrain from hazarding a single conjecture of our own respecting the time or manner of the world's origin; but we cannot help thinking that Ovid, the Greeks, and modern geologists are all wrong in their notions of a primeval chaos. It seems contrary to the whole analogy of nature, and opposed to the usual tenor of the divine operations. Every thing appears to have been made perfect and complete at the outset, as suited to the use for which it was designed. All the items of the Mosaic creation are of this character: birds, beasts, fishes, reptiles, herbs, trees, men, with light, atmosphere, seas, dry land,—all started up into mature existence at the fiat of Jehovah. On this ground, we object to the usual geological schemes of a gradually nascent world; whilst we would neither affirm nor deny a previous occupation of our own planet.

We see a greater degree of consistency, at least, in those old writers who imagined this earth to have been created, in glorious perfection, for the abode of intelligent beings, of a different race from our own; who left their state of innocency as man has done, and fell under their Maker's displeasure; that, consequently, they were visited with a dreadful mark of the Almighty's disapprobation, (a flood, fire, earthquake, or whirlwind of darkest storms,) by which the rebels were punished, and their habitation made desolate; that when, in scriptural language, "the earth was without form and void," (troubled and waste,) "and darkness was upon the face of the deep, and the

Spirit of God moved" in coming mercy "upon the face of the waters," it pleased Him to remove the cloud of his wrath, and remodel the globe for a new family of occupants; that in consonance with the future wants of these tribes, an atmosphere was ordained, a dry land and ocean made, full-grown herbs and trees, with their seeds and fruits, created, and the earth's axis so regulated as to produce the requisite seasons for vegetable and animal life.

We do not bring forward these antiquated notions as affording a real interpretation of the first verses of Genesis; but we think them a more feasible mode of reconciling the doctrine of a former world (if such there was) with the truth of Scripture and the analogy of nature, than the theories propounded by modern philosophers, who have not yet disproved the opinions of their predecessors in the field of speculation. Those also who wish for a reason (if there be any) why evil spirits harass this lower world,—as the Bible tells us they do,—may think to discover it in the supposition of such demons having once been the happy tenants of the globe which we now inhabit.

Dr. Pye Smith affirms, that there never was a period when the earth was destitute of organic beings; and most geologists agree with him in believing that man is of more recent origin than other species of animals now his contemporaries. These views cannot be harmonized with the Mosaic narrative; in which it is asserted, that the earth was "void" when the present forms of life originated; and assigns a distinct day for the time of their creation. "And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after its kind," on the fifth day. Terrestrial animals, including mankind, were made on the sixth day. The human species, therefore, commenced at the same epoch with all others that now inhabit the earth, the air, and the sea; and nothing, the descendant of which now lives, existed prior to that era.

That there was a progressive developement of animal life, is usually maintained by those who believe in a gradual improvement of the system, from an embryo state of mud or vapour, to the more perfect condition which is now exhibited. They suppose that a progressive organization was instituted, from the lowest order of testacea up to the highest mammifers, and from the poorest grass or sea-weed up to the most elaborated trees; according as the earth was progressively fitted for their reception

and entertainment. Sir Humphrey Davy, amongst others, says, "It is impossible to defend the proposition, that the present order of things is the ancient and constant order of nature, only modified by existing laws; there seems, as it were, a gradual approach to the present system of things, and a succession of destructions and creations preparatory to the existence of man." Mr. Lyell, on the opposite side of the question, declares, that the laws of nature have always been uniform, and that every change has been effected by its modifying influences; and that Sir Humphrey's proposition, "though very generally received, has no foundation in fact." Such is the agreement of cosmogonists!

The hypothesis of a *growing* world is overthrown by the appearance of sundry fossil remains, which certain geologists have thought well to overlook. For instance: the remains of fish appear "in one of the lowest members of the group;" the vertebra of a Saurian has been met with in the mountain limestone of Northumberland; teeth of carnivorous fish have been taken from a similar formation in Fife; some remains of cetacea have been met with in the oolitic series of England, together with the bones of two species of warm-blooded quadrupeds; fragments of decotyledonous wood have been obtained from the coal-fields of Fife and Northumberland, and from the grey-wacke of Cork, &c. Hence it would appear, that every new system of cosmogony continues in vogue but for a short time: for so soon as some practical geologist happens to oppose it, they easily find fossils in particular situations, where their appearance is incompatible with the truth of the recent hypothesis. There is no theory extant, amongst the multitudes which have started up during the last three centuries, that has not been pronounced irrelevant by other *great names*.

Mr. Lyell maintains that "all former changes of the organic and inorganic creation are referable to one uninterrupted succession of physical events, governed by the laws now in operation." It is scarcely needful to remark, that this assertion is quite opposed to the Mosaic narrative. Mr. Lyell, indeed, affirms that "Geology has nothing to do with religion;" and this is evidently his practical view of the case. But *we* cannot assent to such a doctrine; for, although the Bible was not given to teach us Geology, yet if the dogmas of science contradict any items of sacred *history*, they certainly oppose the truths of revelation. If Moses, the Psalmist, St. Peter, and St. Paul,

teach us that all existing forms, animal and material, were framed by the simple *fiat* of Deity; then either they are found to be false witnesses for God, or Mr. Lyell's speculations are untenable. There is no midway between these two positions. The language of these inspired writers is not figurative, but plain words of an intelligible character. The Mosaic creation was, at least, a new system of physical and animal organization; so much so, that it did not even rain until the flood; for "there went up a mist from the earth, and watered the whole face of the ground:" (Gen. ii. 5, 6:) but after the deluge, when the Lord was pleased to visit the earth with showers, He so ordered the refraction of light upon the new clouds, as that a rainbow should appear as "a token of the covenant between him and the earth."

The Bible fully declares that our present system was *completed* in six days, by successive acts of creative power, not by a continued exercise of Nature's laws. Dr. Pye Smith's theory virtually denies this revelation: for although he admits a renewal of organic life to have then taken place, yet, inclining to the Nebular hypothesis, he denies any *entire* modelling to have occurred, limiting it to a particular part of the Asiatic continent. He also assents to the scheme of those physiologists who hold that there were several creations of existing species, in different parts of the world, at times remote from each other. Though here again a vast disagreement is found in the number of regions assigned for the distribution of animals; some theorists estimating them at seven, others at five, eleven, twenty-seven, or forty-five! How is this speculation compatible with the scriptural declaration, that all other animals were made subject to Adam, and that the beasts and birds were brought before him to receive their names? Mr. Lyell very carefully omits any reference to the origin of things, by merely going back to *indefinite* ages, and there leaving the world in something like its present circumstances. Does he believe in the eternity of Nature?

Before man existed, *who* peopled the globe? "O," say modern geologists, "plants, and fishes, and other brute animals." Upon this general proposition they are all agreed, though they greatly differ in the particular details. Cuvier's disciples evidently suppose the world to have been made for the use of man, after undergoing a laborious preparation during many thousands of years, and sustaining some grand revolutions, by which it

was finally fitted to be the comfortable abode of human beings. Mr. Lyell, again, regards its occupation by our species as a mere contingency, of little consequence to its history, and as scarcely deserving of notice in its endless annals. The more Christian Nebularists think that the earth was peopled, in its different stages of growth, by plants and animals of a corresponding grade; and that having lately reached that state of perfection which was suited for man, he was forthwith created and ordained to be its tenant. Most of the French school suppose every thing to have happened by chance; so that it was quite an accidental circumstance for our race to have appeared, either at this or any other epoch of eternity. It is evident that these opinions cannot be reconciled with each other; and we believe them all to be erroneous, and contrary to the plain analogy of nature.

The present world was evidently arranged with reference to its existing inhabitants. When we perceive an adaptation of parts in any piece of mechanism, we at once conclude that they were all made by a master's hand, at the same period, and for a particular end. Therefore, when we find all the component parts of our system, and all the laws or courses of Nature, to be modelled after such a fashion as evidently to suit the vegetable, animal, and intellectual families dwelling upon its surface; we reasonably infer that the whole was devised by an Infinite Mind for the very design which we perceive to be accomplished. Nor is there any valid objection to this argument, from our not yet being able to comprehend the final purposes of an almighty agent, or from the imperfect occupancy of the habitable part of our globe. There is a great difference between making a thing for future use, and making it with an intent of destroying it before it should be used. Upon visiting a mansion, elegantly constructed and beautifully garnished, we should immediately judge it to have been modelled for the convenience of some intended inhabitants: and, although certain parts might not be instantly occupied, we should never dream of their having been laboriously wrought for the purpose of being pulled down and built up again before they should be tenanted. This would be a sign of defective knowledge or foresight on the part of the proprietor. Who makes a candle to burn it away in an empty house? Who prepares a sumptuous banquet without an intention of its being enjoyed by suitable guests?

Upon looking into the component parts of our mundane

system, we see them to have been made and harmoniously fitted to meet the wants of the various tribes that now occupy the earth.

The elements of the *atmosphere* are very nicely mixed, to suit the life and health of animals, the growth of vegetables, the nature of speech, the organs of hearing, the navigation of seas, the propulsion of wind-mills, and divers other comforts of mankind. Shall we then say, with modern Geology, that the same atmosphere was in existence during the lapse of many hundred millions of ages, when there was no man, or beast, or even plant on the surface of the ground?

Would there be any wisdom in such a waste of chemical power, for the purpose of disintegrating some hard rocks, or supporting a few tribes of shell-fish, dwelling alone at the bottom of the sea? Mr. Lyell may retort, that some parts of the world are still untenanted: but, according to the Bible, this was not the intention of the Creator; it has been caused by the sinfulness of man. One of the first injunctions given to our race was, "Be fruitful and multiply, and replenish the earth:" and wheresoever men have lived in a state of peace and virtuous industry, they have speedily filled their native lands, and been obliged to emigrate, in order to find subsistence in unoccupied territories. Mr. Malthus calculates upon an almost fearful rate of increase to a people placed under favourable circumstances. War and vice have kept down the natural increase of the human species; whilst the brute creation have spread abroad, and have occupied the fertile soil abandoned by their unworthy lord.

So with respect to *light*. It forms the atmosphere of countless suns, to illumine the planets and their attending satellites. Yet when we also consider the important part which it fulfils in our vegetable economy; its wonderful adaptation to our visual organs; the scope which it gives to our intellectual powers; and the enjoyment which it affords to taste in the beauties of the landscape, the adornment of animals and herbage, the coruscations of the heavens, and the pleasures of the pictorial art;—who would for a moment imagine that so glorious a gift had been vouchsafed, through countless ages, when there was no eye to see, no mind to perceive, no country to be lighted up, no plant to be reared,—but only a dull chaos of heartless mud, or a refrigerating mass of heated vapour, or bare rocks of the transition and secondary strata?

Let us look at the *earth* upon which we tread. It is rich, and

capable of high cultivation ; so as easily to afford support to the rude agriculturist ; and yet, by a better tillage, to feed the teeming multitudes of a mighty empire ;—thus promoting a congregated state of society, and aiding the advancement of art and civilization. Or, if we examine the opportune situation of metalliferous veins and useful clays, the different degrees of hardness in stone, the nature and location of coal-measures, and the slanting direction of the inferior strata, by which we obtain access to all the treasures of the ground, we perceive them to have been arranged with evident design for man's convenience, and to prompt the interchange of commodities or national trading. Surely this wonderful condition of the earth was not designed without reference to its immediate occupation by man, in whose absence the soil luxuriates to waste, and Nature's prodigal gifts seem to languish for want of a master, whom she invites to come and enjoy her ample resources.

We might dilate in a similar way upon other parts of our system ; but these examples are sufficient to show the force of our argument. The whole analogy of nature declares that it was formed *at once*, in its present mode, by a display of the infinite wisdom and power of a Supreme Being. This doctrine does not preclude the existence of a former world ; but, *if there was one*, it was doubtlessly created in a perfect state like that of our own, and was afterwards destroyed through the indignation of Deity against its sinful inhabitants. If we may suppose the latter event to have occurred, we shall perceive an interesting harmony to pervade the moral government of the universe ;—happiness and order being the result of virtue, discord and destruction the wages of iniquity. Every cosmological theory which separates the works of creation, and breaks the manifest union of design with which they are enstamped, for the purpose of upholding one part in preference to another, is “found wanting,” when “weighed in the balance” of common consistency. The plain scheme detailed in the pages of Revelation alone harmonizes all the works of God ; and, without giving any history of former worlds, informs us of all that we require to know respecting the origin of our own.

On the same grounds, we are led to believe that when the antediluvian world was destroyed because of man's sin, (not from any usual operation of Nature's laws,) it was re-organized with regard to the altered character of its inhabitants, in the shortening of human life, the confusion of tongues about to

take place, and a new character of providential dispensation. The scriptural record of these transactions is godlike, and worthy of God: while geological theories are amazingly puerile. A heathen philosopher judged more correctly than our modern speculators. Cicero asks, "For what purpose was the great fabric of the universe constructed? Was it merely for the purpose of perpetuating the various species of trees and herbs, which are not endued even with sensation? The supposition is absurd. Or was it for the exclusive use of the inferior animals? It is not at all more probable that the Deity would have produced so magnificent a structure for the sake of beings, which, though endued with sensation, possess neither speech nor intelligence. For whom, then, was the world produced? Doubtless, for those beings who are alone endued with reason."

Dr. Ure, in his "New System of Geology," says, "That the earth was constructed with reference to the accommodation of living beings at the volition of Omnipotence, will not be denied by any rational naturalist. It is difficult to imagine, therefore, what benefit even theoretic cosmogony can derive from antedating the creation of a chaotic mass, any period of years, whether thousands or millions. We thereby merely approximate creative might to the standard of human imbecility. Because the chemist must wait many days, perhaps months, before he can draw forth regular crystals of saline solids from his heterogeneous solutions, must the Deity be supposed to require indefinite ages for crystallizing the granitic nucleus of the earth, and depositing over it the shelving layers of gneiss and mica-slate?"

To these witnesses we assent, and inquire,—Whence the use of all those sceptical or fanciful speculations? If parts of our globe be of crystalline structure, could not the Almighty, who made the human eye, make *them* so by the "word of his power?" If other rocks be stratified, do they not thus resemble the scales of a fish, which are not finished separately and then agglutinated, as would be done by a human mechanic? We can perceive no wisdom in so lengthy a creation, when it could be as easily effected in a short time by a few acts of Omnipotence. But the idea of so tedious a process as that depicted by modern Geology, seems altogether absurd. There is no *reason* for so great a waste of time and energy.

An architect first considers the sort of house which he intends to build, and forms a plan of its constituent parts, suiting the materials and partitions to meet the comfort of its expected

occupants. He then rears the structure from its foundation in conformity with this pre-conceived arrangement. He does not first compose the outer shell of a heterogeneous nature, and then pull down or alter various portions, that he may construct the chambers, closets, doors, windows, and chimneys. An untutored negro or wild Hottentot may proceed on so foolish a system; but, surely, not the civilized builder. The argument, therefore, comes to this point:—Was there a heavenly Architect? Why did he make the world? Shall we divest Him of the common sense which he has given to man, or the instinct which he has allotted to bees and ants, by supposing Him to have commenced his work without a plan, and in ignorance of the wants of the creatures whom he was about to make; or, to have proceeded in his operations in a thoughtless way, pulling down and altering his building many times, before he could bring it to accord with his wishes? Are these our notions of Deity? It is easy to talk of the freaks and chances of *Nature*; but he who thus speaks of the divine work because he cannot understand it, libels the attributes of Nature's God, and is a practical infidel.

There now lies before us the splendid map which adorns Dr. Buckland's *Bridgewater Treatise*; and nothing more is wanting to assure us of the utter futility of all modern cosmological systems, in all their modifications. To the analytic mind, it is a perfect proof that the present world was modelled *at once* by the omnipotence of an all-provident Lord. Its varied and intermingling strata and veins banish the very idea of a long aqueous deposition or igneous origin. Its perfect adaptation for man's convenience (and for nothing else that we can conceive) proclaims a gracious Providence; whilst its general regularity, with ever-changing features, shows the boundless skill of Infinite Wisdom. And if there be a few marks in the landscape for which we cannot account, some apparent vegetable or animal remains, whose history has not been recorded, let us not, in order to conceal our ignorance, attempt to rear a fancied fabric, every part of which bespeaks our impotency of understanding, and manifests the utter folly of human pride, when it would endeavour to create planets or garnish worlds.

THE DELUGE.

THE doctrine of a general deluge has been incorporated into the religious creed of most nations ; and, until of late years, it has been received as a biblical truth, accurately detailed by the sacred historian. If any regard be paid to universal tradition, simple-minded readers of the Bible are not wrong in their interpretation of that great catastrophe which took place in the days of Noah. A short time ago, philosophy came forward as an ally of religion, in opposing the scepticism of those days, by attesting, that such a flood must have occurred about the period mentioned by Moses. Nothing could be more positive than the language in which these discoveries of science were then couched. It was said to be indisputably proved, that a grand deluge had really taken place, and that the geological phenomena of every country corroborated the truth of inspiration and the traditions of all nations. Cuvier says, "I think with Deluc and Dolomieu, that if there be any thing settled in Geology, it is this, that the surface of our globe has been subjected to a great and sudden revolution, the date of which cannot be carried much further back than five or six thousand years." Again : "The Kirkdale caves, most carefully described by Professor Buckland, under the name of *Diluvium*, and exceedingly different from those other beds of similarly-rolled materials, which are constantly deposited by torrents and rivers, and contain only bones of the animals existing in the country, and to which Mr. Buckland gives the name of *alluvium* ;—they now form, in the eyes of all geologists, the fullest proof to the senses of that immense inundation which came the last in the catastrophe of our globe."

But within the last decade, a terrible revulsion has taken place from the opinions of Cuvier ; and some of his firm supporters have publicly renounced their supposed heterodoxy ; consequently, the book of Genesis has greatly fallen in their esteem as a true history.

We blame Dr. Pye Smith for the active part which he takes in straining the meaning of scripture to meet his ridiculous notions of the nebular hypothesis. A teacher of Christianity ought to handle such a subject with great delicacy ; and if he find himself obliged to deviate from the prevailing opinions of

the church, he ought either to harbour his dubious sentiments within his own breast ; or, at least to keep as closely as consistency will allow, to the ancient landmarks. But he has chosen a different track, and has set himself prominently forth to uphold the speculations of Geology at the expense of holy writ. We would ever make full allowance for a free scope in verbal criticism ; and had the Doctor kept himself within these bounds, we would only have suggested a little modesty in his method of assertion ; but, as it is, some of his positions are quite untenable along with the sentiments of inspired writers.

Dr. Smith grounds his argument for a *partial* deluge on the occasionally limited use of the terms "earth" and "the whole earth" in the sacred volume, to denote the *known regions* of the globe, or even the land of Judea only. This is readily granted ; for the same Hebrew word means "land," "country," and "earth ;" and the true distinction between these terms has not always been kept up in *our translation*. It is impossible for one original word to give all the shades of signification denoted by several English words. The distinctions in Hebrew are therefore marked by suitable adjuncts, or by a general reference to the subject in hand. When we read that "all the high hills that were under the whole heaven were covered," we feel that the strongest language possible has been used on the occasion. Besides, from the known laws of hydrostatics, the "high mountains" of Asia Minor could not be overwhelmed without an inundation of the whole planet. Dr. Pye Smith believes the *low* hills only of that *small region* to have been inundated ; but he must first prove that the words "all the high" are interpolations ; or else he *flatly contradicts* the narrative of Moses. Let geologists allow that the high mountains of Asia have been elevated since the flood, or at the close of that event, and we shall be prepared to meet them half-way ; for we would not attach any bigoted meaning to such a phrase as "all the earth," when unaccompanied by any modifying or explanatory terms.

But this would not serve the purpose of our theorists. Their object is to exempt the major part of the brute creation from the destruction which came upon man and the animals in the vicinity of his narrow dwelling-place. Calculations, however, have been made to show that much of the earth must have been peopled before the flood ; a fact which would utterly destroy this theory. Nor is it for man to assign any reason for the extent of a deluge, since the punishment of sin remains

with a righteous Lawgiver. "And the Lord said; I will destroy man whom I have created from the face of the earth; both man, and beast, and the creeping thing, and the fowls of the air." "The end of all flesh is come before me; for the earth is filled with violence through them; and, behold, I will destroy them with the earth." (Gen. vi. 7, 13.) In these passages, the destruction of men, beasts, and the earth, is spoken of in the same language; nor can we understand how the extirpation of the animals of "one region," (the one hundred and thirtieth part of the globe,) is compatible with the following emphatic language: "And all flesh died that moved upon the earth, both of fowl, and of cattle, and of beast, and of every creeping thing that creepeth upon the earth, and every man: all in whose nostrils was the breath of life, of all that was in the dry land, died. And every living substance was destroyed which was upon the face of the ground, both man, and cattle, and the creeping things, and the fowl of the heaven; and they were destroyed from the earth: and Noah only remained alive, and they that were with him in the ark." (Gen. vii. 21—23.)

St. Peter's language, also, respecting the deluge is very strong: "God spared not the old world." "By the word of God the heavens were of old, and the earth standing out of the water and in the water: whereby the world that then was, being overflowed with water, perished." We fear that Dr. Pye Smith must adopt a new mode of biblical interpretation, quite unintelligible to common minds, before he can harmonize these passages with his diluvian theory. Does "the face of the ground" mean the country of Asia Minor? What is signified by "the fowl of the heaven?" Why did not the birds fly over the "low hills" and escape? They seem to have had little instinct in those days.

Another important item in the new geological scheme requires observation. Should we admit a limited inundation to have taken place, the necessity for a miraculous interposition of Deity would be excluded, and the whole catastrophe might be easily attributed to a "natural occurrence," according to the well-known course of nature's operations. We believe this to be the end that is aimed at by modern philosophy. If the deluge in any way resembled one of the ordinary catastrophes by fluvial or volcanic agency, it could not have been any special mark of God's anger against sin, not being signally connected with a token of his displeasure. Accordingly, Dr. Pye Smith regards

it as one of a series of local floods which have devastated many separate regions of the globe. He doubtlessly acknowledges it to have happened in consequence of human guilt; but we can perceive no midway position between a miraculous display of Divine vengeance, and the ordinary routine of providential working. If the former be entertained, we must renounce the latter, by regarding nature's usual laws as having been temporarily suspended, to permit of a special intervention of Deity. This is a point of great weight in the argument: for the moment that we admit the interference of Almighty Power, all minor difficulties in the transaction must vanish. When He takes a matter in hand, none can limit his agency, or say in what particulars He may choose to exert an unwonted influence. Now, if we receive the account furnished by Moses, as being divinely correct in all its minutiae, we must infer that the deluge, and every thing connected with it, was *miraculous*; and this would be a sufficient answer to the "cavils" of Dr. Pye Smith upon some accompaniments of the transaction.

Amongst other things, he finds fault that there was not sufficient water to drown the whole world, as at present constituted. This argument is fallacious in several respects. *First*, he assumes that the surface of the globe was then similar to that which now appears; but this was the very thing that ought to have been *proved*. How does he know what was the former height of the mountains? *Secondly*, he proceeds upon a supposition that he is acquainted with the depth of the sea. His authority is the calculation, or rather the conjecture, of Laplace, who defined the average depth of the ocean to be about three miles. But this was a mere assumption. He took it *for granted* that the depressions of the earth are similar to the elevations, the greatest being about five miles. We might, however, on the same ground, form an opposite opinion, with more apparent reason, by supposing that the cavities or converse hills of the earth are proportionately larger than the eminences; by so much as the extent of the sea is greater than that of the land; in which case, there would be oceanic depths to the extent of twelve or fifteen miles. So that, by upheaving this bed of waters, there would be abundance of fluid to overwhelm our mountains, especially if they have risen in height since that epoch, as we shall show to be highly probable. It is too bad for Dr. Smith to oppose scriptural narrative on the ground of one of Laplace's *hypotheses*! *Thirdly*, he denies the existence of large caverns of

water, because this would not suit his theory of an inward fire. Here, again, his assertion is altogether gratuitous ; for if we should maintain the contrary, we should be quite as much deserving of credit ; especially, as it is well known that mining operations cannot be carried to a great depth under ground, through an immoderate influx of water, which prevents men from penetrating far beneath the surface. *Fourthly*, Dr. Smith supposes that the deluge took place without any great disruption of the earth's strata ; an opinion propounded by several recent authors ; but, like the rest, it is a mere affirmation of the point which ought to have been proved. The fallacy lies here : they have discovered certain alluvial deposits and beds of gravel, which they declare to be antediluvial, (though, a few years ago, they thought them to be undoubted proofs of the deluge !) which they say the flood would doubtlessly have removed from their present locality. Let us give a specimen of Dr. Smith's logic upon this subject. He argues, that some loose ashes on an old French volcano could never have resisted the force of a general flood ; and his proof of their vast antiquity is the negative one of Julius Cæsar not having recorded any tradition of an eruption, which, be it observed, might have happened, according to Dr. Hales, two thousand years before Cæsar's time, and yet have been posterior to Noah ! If cosmologists are obliged to *rake up* such evidence as this, it is a poor sign of the goodness of their cause. A true philosopher would disdain to use such trumpery sophisms.

Dr. Pye Smith farther asserts, that in case of a general inundation, all the fish must have perished, from a mixture of salt and fresh water. But fresh-water fish have been found to live in briny fluids ; and the inhabitants of the ocean are equally accommodating in their habits. Besides, we do not know how salt the sea then was : or what might have been done by Almighty Power in miraculously preserving the fish as He did the land-animals. Leuwenhoek counted 9,384,000 eggs in a middle-sized cod, and a carp lays 20,000 eggs ; so that it would only require a few of each kind to re-people the waters. Does Dr. Smith acknowledge the miracle which our Saviour wrought about the tribute-money, which was taken out of a fish's mouth ? If so, he need find no difficulty about the flood. We suspect that he wishes to prove *too much* ; for it is a fact that there *are* fresh-water fish in Judæa and Asia Minor at the present time, and so there were fish in the days of King David :—how did they come there, if all

had perished by a local inundation through the upheaving of the beds of the neighbouring seas? Who re-stocked the Asiatic rivers?

Our cosmological divine only plunges into greater theological difficulties every new step that he takes in the argument. Moses tells us explicitly that the earth was covered with water when God first called forth the dry land, and separated it from the mighty seas. Hence it is evident that at the beginning there was enough of fluid to cover the globe: and if the geologist should be able to prove that this was not the case at the deluge, he would thereby acknowledge that a mighty change in the whole system had taken place in two thousand years; which would be a practical refutation of his own hypothesis of the stability of nature and her laws. In accordance, also, with Dr. Smith's argument, as above discussed, there must have been an entire destruction of animal life, marine as well as terrestrial, at the time of the six days' creation; because the world was then *covered with water*, and there were *no living creatures* in its wide expanse. There is no escape from this dilemma. If Moses be right in his record of the pristine inundation and its immediate consequences, Dr. Smith is *wrong* in some part of his theory.

A similar "cavil" has been raised about the vegetable world. Dr. Smith is sure that all trees and herbage must have died during the deluge, if it had been universal: but, he relates that a boabab has been discovered in India of the age of five thousand two hundred and thirty-two years. That is, it lived two hundred and thirty-eight years before the flood, according to Hales's chronology. A taxodium, also, has been found by Professor Henslow, to which he gives a date of from four to six thousand years. The latter has nothing to do with the argument, and we wonder why it was introduced; for four thousand years is within the post-diluvian era: and if the learned professor cannot be sure as to two thousand years of its age, it is a poor sign of the accuracy of this botanical evidence. If the case of the boabab be at all similar to that of the taxodium, we may at least allow one thousand years for variation of conjecture, and then the difficulty has vanished! Besides, in so great a diversity of opinion about ancient dates, perhaps even Dr. Hales may be in advance about two hundred and forty years, which would make the matter all right. For, in either of these events, we might turn round upon Dr. Smith, and on his own grounds prove the fact of a universal deluge, from the universal destruc-

tion of trees at that epoch, seeing that none can now be found of an ante-Noahic age,—they can be traced up to that patriarch's time, and there they fail,—and we might assert this to be a strong argument against modern Geology.

But Mr. Lyell would lead us to form a different conclusion respecting the death of trees. He says that in the deepest parts of the lake Bistineau, in the Red River of Louisiana, “are seen numerous cypress-trees of all sizes, now dead, and most of them with their tops broken off by the winds, yet standing erect under water. This tree resists the action of air and water longer than any other, and, if not submerged *throughout the whole year*, will retain life for an extraordinary period.” So, in the Caraccas, in the year 1790, a large lake was formed by the sinking of a portion of the forest of Aripao; the water being eighty or one hundred feet in depth, yet “the trees remained *green* for several months under water.” Dr. Smith ought, therefore, first to have made the experiment, before he affirmed that all the trees would perish during the seven or eight months that they were covered by the Noachian flood.

We fear that Moses is here again at issue with the geologist. For he tells us that a dove, being sent out of the ark by Noah, returned with an olive-leaf in her mouth; from which circumstance, the patriarch “knew that the waters were abated from off the earth.” Hence it is morally certain that Noah did not suppose the trees to be dead; and we must imagine him to have known better than we can do at this great distance of time. Regarding the Bible as true, we positively affirm that all the trees were *not* destroyed during their inundation, and that Dr. Smith is here directly *opposing* the sacred historian.

Once more: he objects to the commonly-received notion of a universal deluge, from the difficulty of accommodating all the species of animals in the ark, and from the impossibility of their afterwards living in different climates. As the question of species will presently be discussed, we shall now pass it over with one remark,—that we cannot perceive so much dissimilarity between various kinds of lions, tigers, elephants, or crocodiles, as there is between a tall, fair, elegant, Arab lady, and the black, stunted, squatted, curly-haired Negress, whom her lord has captured from the other side of the Desert,—both of whom Dr. Smith acknowledges to be the descendants of Noah.

Geologists seem to imagine that we regard the brute creation, upon their disembarkation from the ark, immediately to have

bent their way to far-distant lands, subject to the greatest variation of heat and cold; instead of their gradually migrating from Asia Minor, and by degrees accommodating themselves to a difference of climate. Besides, we agree with them in supposing that the general temperature of the world was milder than it is at present; which hypothesis strips the subject of its chief difficulties; and we hope that our opponents will bear this in mind when they sympathize with the forlorn condition of the Noachian animals. We may be allowed to assure Dr. Pye Smith, that we should heartily join in his condolences with the patriarch and his family, concerning their perilous descent down the cliffs of Ararat, if the Bible had informed us of their being placed in so fearful a situation; but since it does not point out the particular hill upon which the ark rested, nor describe the mighty effects which volcanoes and earthquakes (to which that country has been very subject) may have since produced, we shall reserve our commiseration until we shall have been favoured with more certain information.

DEPOSITION OF STRATA.

THERE is nothing for which cosmogonists ask with more incessant importunity, than for a great quantity of time. If this requisite be granted, they can account for every thing; without it, they are perfectly helpless. Yet they widely differ as to the periods necessary for arranging the crust of the earth into its present form; some being content with a few myriads of years, others demanding many millions of ages. Though it is certain that the world has undergone mighty changes since its creation, we are ignorant of their extent, and of the power of those means by which they have been brought about; consequently, we cannot specify the lapse of time during which they have been effected. It has been well remarked that our highest mountains are quite insignificant, if compared with the mass of the planetary orb. Their height would not be represented by more than the thickness of paper on a terrestrial globe of ordinary dimensions: and, since the contents of our planet are hid from

observation, we can form no adequate conception of their influence upon its frangible surface.

The notion of our dwelling upon a fluid mass of burning matter, nearly eight thousand miles in circumference, is altogether preposterous. What would become of the scum of an eighteen-inch caldron, at a temperature sufficient to dissolve silex? Would it cool? Allowing the superficial strata to be thirty miles in thickness, this is only a two hundred and sixty-sixth part of the earth's bulk; would Dr. Pye Smith wish to live with Dr. Mantell and Mr. Babbage on a silex-furnace, two hundred and sixty-six inches in diameter, having the privilege of first throwing an inch-coating of stone over the incandescent fluid? We should think a foot-wall to be a very slight protection from a glowing mass of rock, eighty-eight feet in size; and should prefer dwelling at a considerable distance from so dangerous an object,—feeling assured that on the top of its thin covering, (supposing it not to be dissolved,) there would be little chance of our organic remains being preserved for the inspection of posterity. Wise men sometimes make egregious blunders when they begin to speculate upon subjects of which they literally know nothing. Yet it is by such absurd theories that geologists attempt to explain the *order* of the earth's strata, and the destruction of fossil remains from the *primary* rocks.

Leaving the centre of our planet, we would spend a short time upon its surface; premising that we are nearly as ignorant of its former condition, as we are of the interior structure. Authentic history conducts us back but a very few centuries—excepting some little spots which were described by the Greek and Roman writers. But if we knew the exact topography of the whole world for the last two or three thousand years, we should still be in the dark as to its pristine changes. Recent alterations have been effected by floods, earthquakes, and volcanoes; whose intensity has varied during different ages, and in different situations: so that no argument can be rightly drawn from the present extent of these operations in any particular locality. Those countries which are now in the most peaceful condition, may once have been the subjects of awful convulsions, and that on a scale of magnitude of which we have no modern examples. Mr. Lyell has given us a graphic account of sundry movements that have been recorded during the last one hundred and forty years; and fearful indeed are the catastrophes which

he has described. If, then, we remember that the Mosaic creation took place six or eight thousand years ago, we may draw largely upon such a period for vast alterations in the world; nor shall we require an eternity to account for the present disturbed appearance of its minerals.

When Dr. Pye Smith visits a Silurian mountain, a few hundred feet high, he immediately looks backward to the revolution of "untold ages:" and when he perceives a deposit of shells upon an eminence, he imagines himself to be in a region which was modelled at an indefinite period of antiquity. A coal-field, originating from the debris of ancient forests, seems to the Doctor to have been the slow product of "countless centuries:" and even the London basin, with its variation of land and marine stratifications, reaches into the gloomy vista of immense "geological epochs."

All calculations respecting the rate of deposition of any order of rocks will appear futile, if we only suppose changes to have occurred in our island similar to those which have recently passed in distant countries. The more we become acquainted with geognostic facts, the more we shall feel ourselves inadequate to the task of accounting for those phenomena which have happened beyond the range of actual observation. From the appearance of certain rocks and organic remains in the geology of Great Britain, we have every reason to believe that this country was once the theatre of considerable volcanic and diluvial influences; in which case, those very phenomena which have struck geologists with the idea of a protracted series of operations, may have been caused in a brief space of time, without any violence being done to the analogy of nature. To illustrate this point, we shall give a few examples from modern history.

Limestone is formed in great abundance by a spring issuing from the hill of San Vignone, in Tuscany. "So rapid is the deposition near the source, that in the bottom of a conduit-pipe for carrying off the water to the baths, inclined at an angle of 30°, half a foot of solid travertine is formed every year. A more compact rock is produced where the water flows slowly. It is generally white: some parts of it are compact, and ring to the hammer; others are cellular, and with such cavities as are seen in the carious part of bone or the silicious *meulière* of the Paris basin. Sometimes the travertine assumes the botroidal and mammillary forms, common to similar deposits in Auvergne,

and, like them, it often scales off in thin, slightly-indulating layers." One of the branches of this stone "descends to the west, for two hundred and fifty feet in length, of varying thickness; but sometimes two hundred feet deep." Another spring, the San Filippo, at a few miles' distance from the former, furnishes a foot of hard stone in four months, and exhibits a circumjacent mass on the declivity of the hill, one mile and a quarter in length, and two hundred and fifty feet in thickness. "But what renders this recent calcareo-magnesian limestone of peculiar interest to the geologist is, the spheroidal forms which it assumes; offering so striking an analogy, on the one hand, to the concentric structure displayed in the calcareous travertine of the cascade of Tivoli; and, on the other, to the spheroidal forms of the English magnesian limestone of Sunderland. Between this latter and many of the appearances exhibited at San Filippo, and several other recent deposits of the same kind in Italy, there is every feature of resemblance; the same combination of concentric and radiated structure, with small undulations in each concentric ring, occasional interferences of one circle with another, and a small globular structure subordinate to the large spheroidal, with frequent examples of laminae passing off from the external coating of a spheroid into layers parallel to the general plain of stratification." Sir H. Davy informs us, that he fixed a stick on a piece of travertine in the water of Solfatura; and in eleven months it was cased with a mass of hard stone, several inches in thickness.

A few simple facts like the above set at nought all the speculations of man as to the origin of calcareous rocks, the formation of which has not been recorded. On this scale of progression, a bed of one thousand feet might be constructed in two hundred and fifty years; and, being afterwards upraised by a volcano, might produce a vast mountain, covered with verdure and young trees, in the space of three centuries! We remember also, that the principal organic remains have been found in such formations—in limestone, limestone-caves, marl, gypsum; or else in the sand and clay of wooded rivers. Nor must we forget that there are springs holding *silex* and other mineral substances in solution; which may *once* have been as abundant in their deposits as the present calcareous waters of Italy. On this principle, Dr. Smith's Silurian mountains need excite no wonder, as they would require but a very short time for their developement.

Coal is supposed to have been formed out of the debris of

ancient forests : and many theories have been proposed concerning the accumulation of such great quantities of timber. Some suppose it to have been floated into a large basin by violent streams and inundations ; others argue, that it must have been reared in its present locality, on account of the upright position of many of the trunks found in the mineral. The latter notion is absurd ; as every naturalist knows, that so great a quantity of vegetable matter cannot grow together, and a new generation of trees would require a new earthly soil in which to vegetate ; so that, instead of one dense stratum of coal, we should necessarily have a number of very thin strata, with thick beds of mould intervening. Now, supposing our coal-fields to have originated from the remains of ancient timber, let us attempt to form an idea of the rapidity with which it might have accumulated, from the following authenticated facts.

A mass of timber, ten miles in length, two hundred and twenty yards wide, and eight feet deep, was collected in one arm of the Mississippi in about thirty-eight years, in consequence of some obstruction in the channel of the river. This raft is continually increasing, and, although floating, is covered with green bushes, and a variety of beautiful flowers. At this rate, Dr. Smith might get a capital coal-field in a single century ; by merely supposing a great mass of mud to fill up such a valley, (as has often occurred,) thus diverting the river-course, and pressing the accumulated timber and vegetable remains by its superincumbent weight, or in any other way that coal is made, for we have never been present at its manufacture. Again, we are assured, that "great deposits have been in progress at the extremity of the Delta in the bay of Mexico ;" and that Captains Clark and Lewis found a forest of pines standing erect under water, in the body of the Columbia river, in North America, which they supposed, from the appearance of the trees, to have been submerged only about twenty years. So, after the earthquake in Jamaica, in 1692, the rivers were found to have carried down many hundred thousand tons of timber, which appeared like islands in the sea. The inhabitants of Greenland are dependent for their entire supply of wood upon drift timber, which, according to Crantz, is originally washed down from the mountains of Siberia, and floated to Greenland in vast quantities by currents of the ocean. Finally, in 1810, the bursting of a drain in lake Vermont produced a great inundation, by which heaps of wood were formed to the height of eighty feet.

Taking all these circumstances into account, as a very few examples of the vast collections of vegetable substances that are frequently taking place; and remembering that many of these trees are represented as retaining their erect form, we humbly conceive, that any geologist who is an adept at making coals out of decomposed wood, may easily find materials wherewith to perform his work, without having recourse to the tedious plan of growing them upon the spot where he intends the mineral fuel to be laid.

Let us glance at another sort of formation. The "enormous deposits of mud which are seen in many countries, as in the basin of the Tay, Isla, and North Esk rivers in Scotland—alluvions hundreds of feet thick, which are neither stratified nor laminated like the sediment which subsides from water," are said by Mr. Lyell to be very analogous to those "mud lavas" that are still emitted by volcanoes, filling up large valleys at a single eruption. The same author remarks, that "as a continued series of such eruptions as man has witnessed would reproduce another cone like Etna, so a sufficient number of earthquakes like that of 1783 would enable torrents and rivers to re-excavate all the Calabrian valleys, if they were now to be entirely obliterated. It must be evident, that more change is effected in two centuries, in the width and depth of the valleys of that region, than in many thousand years in a country as undisturbed by earthquakes as Great Britain." Now, as our island was evidently the seat of volcanic influence at a former period, it appears that a few ages would be sufficient time for effectuating all the wonderful phenomena, for one part of which Dr. Smith allows some "thirty thousand years." Whether is Smith or Lyell in the right?

The length of time requisite for the superposition of soil between different strata, has long been a question amongst geologists. But when we are told, that over the tuff which envelopes the ruins of Herculaneum, there is "the matter of six eruptions, each separated from the other by veins of good soil;" and that "the Vesuvian lava of 1767 is already covered with a luxuriant vegetation," we feel that any speculation upon the subject is unworthy of the least attention.

The slow abrasion of rocks by the force of water is produced by Dr. Pye Smith, as an incontrovertible proof of the immense age of some mountainous districts, where a stream of water has cut through a rock of one or two hundred feet in thickness.

But such tardiness of operation as that imagined by the Doctor does not always seem to be exhibited. Mr. Lyell offers a very different view of the case: "After the heavy rains which followed the eruption of Vesuvius in 1822, the water flowing through the Atrio del Cavallo cut, in three days, a new chasm through strata of tuff and volcanic ejected matter, to the depth of twenty-five feet." Again: "In the course of two centuries, the Simeto has eroded a passage from fifty to several hundred feet wide, and in some parts from forty to fifty feet deep." Yet this lava, though comparatively recent, is said to be as hard as the most ancient trap-rocks of Scotland, and to have such an appearance of antiquity, as that a spectator might suppose himself to be standing in the rocky gorge of a *primary* district. These occurrences, however, are reported "to be trifling when compared with the great gorges which are excavated in somewhat similar materials in the great *plateau* of Mexico. We must not infer, that, because a stream now flows with limpid waters, producing a very slight abrasion of its rocky bed, it was not once the vehicle of many mountain-fragments, which would cause a speedy erosion of the hardest strata. From the above facts, we must insist that this pretended proof of the antiquity of certain rocks be wholly renounced.

Some geologists allow a long period for the upraising of hilly districts; and, pointing to the shells lying upon their summits, calculate an immense time to have elapsed since these testacea were thrown alive upon a sea-beech, which has now become a mountain. It is true, that we have no recent examples of a considerable elevation taking place in any large tract of country; but we cannot thence argue that such has not been the case in former ages, especially as geologists conjecture that volcanic agency was once much more active than it is at present. We have late instances of a long line of coast being raised a few feet during the shocks of an earthquake; and the action of subterraneous forces upon smaller portions of ground has been very considerable. Through their medium, mountains have been raised, lowered, or split into many parts; valleys have been filled up; lakes have been formed through the subsidence of the soil; considerable tracts of land have been swallowed up; new islands have been formed, and old ones engulfed; villages, towns, and even large cities, have entirely disappeared; and whole districts have been depopulated, as if swept with the besom of destruction. In 1812 "the whole valley from the mouth of the Ohio

to that of St. Francis, including a front of three hundred miles, was convulsed to such a degree as to create new islands in the river and lakes in the alluvial plain, some of which were twenty miles in extent." An eruption in Mexico during the year 1755 at once produced a mountain one thousand seven hundred feet in height! The spot where the old quay of Lisbon stood is now one hundred fathoms under water. The volcano of Cotopaxi has thrown a rock of one hundred cubic yards in volume, to the distance of eight or nine miles; and during an earthquake, waves of the sea, sixty feet high, have flowed in upon the land, carrying all before them, and covering the shore with testacea and other marine substances.

That vast tracts of alluvial soil once composed the beds of large rivers, will be readily imagined by any person conversant with the history of fluvial action. Modern geography informs us of great alterations produced in mighty streams by the accidental presence of very slight obstructions in their channel; these hinderances being speedily increased by the vast quantity of sediment brought down the current, until the river has overflowed its banks, and made for itself a new course through the fertile valleys. From Captain Hall's Travels in North America, we learn, that "some years ago, when the Mississippi was regularly surveyed, all its islands were numbered, from the confluence of the Missouri to the sea; but every season makes such revolutions, not only in the number, but in the magnitude and situation, of these islands, that this enumeration is now almost obsolete. Sometimes large islands are almost melted away; at other places they have attached themselves to the main shore, or, which is the more correct statement, the interval has been filled up by myriads of logs cemented together by mud and rubbish."

Having thus given a few examples of the amazing power of volcanic agency, and of the changes that are produced by running water, let us connect them with some instances of marine depositions.

Several species of shells, identical with those living in the neighbouring seas, are found in Sicily and Calabria, at the height of some thousand feet. The shock which destroyed Penco, in Chili, allowing the water to flow over the town, raised the bed of the sea at least twenty-four feet, and exposed a vast bed of shells similar to those which cover the adjoining hills at the height of more than a thousand feet. When our surveying

vessels were obliged to leave their moorings near the mouth of the Rhone, on account of a strong breeze from the sea, they found on their return the new sand-banks covered with a great quantity of marine-shells; and we understand that, on account of the sand-bars formed at the mouth of this river, some of the *etangs* are alternately salt and fresh, according as the storms of the ocean or the floods of the river occupy the enclosed spaces. A similar occurrence takes place on the coast of Aberdeenshire, ten miles north of Peterhead, in Scotland; where the outlet of a small stream being choked up, about one hundred and fifty years ago, by the drifting of sand, the lake of Strathby was formed, covering a square mile of country. Sometimes the sea breaks through the sandy barrier, and covers the tract with salt water; but by a new deposition of matter, it is again excluded, and the lake resumes its former freshness. Slapton Lee is an example of the same character.

Does not the former class of facts above-mentioned show how easily the most elevated marine-fossils may have been raised to their present situation? And does not the latter explain how quickly several salt and fresh water deposits may follow one another? Now, supposing that five thousand years elapsed between the creation and the time when France and Britain were first known to the civilized world; who shall say what took place during that long period? That they both were under the influence of powerful volcanic agency, is evident to every geographer; and who shall give the dates, or describe the consequences, of such eruptions, with their attending earthquakes, and succeeding inundations? That the whole might have been easily accomplished in a short time, cannot well be denied, admitting the presence of those powerful agencies which have been in recent operation in other parts of the world. And that great devastations may have taken place, without any remnant of the crater's being now visible, is evident from the fact, that eighty large towns in central India were overwhelmed by a shower of ashes, though there is not now any appearance of a volcano for the distance of nearly three hundred miles.

Are the mountains of Sicily and Calabria ante-Mosaic? If so, their imbedded fossils, which are identical with existing testacea, lived before their creation, as mentioned in the Bible. If otherwise, the same power which upraised *them* could elevate any other region of the globe. We neither affirm nor deny the prior existence of our planet; but we cannot help thinking, that

a longer time is not necessary to explain the present phenomena of the earth's surface. Only give us such mighty engines as those above described, and in two thousand years, we would upheave another Great Britain from the depths of the sea, and fashion its rocks and strata, with all their fossil remains, after the exact model of that which our island now exhibits. And who shall set limits to Almighty Power, or say what He was pleased to do in former ages of the world?

Mr. Lyell furnishes a map, in which he depicts the quantity of country that has been covered with sea, since the older *tertiary* strata were deposited,—which territory includes the greater part of Europe. His proof of this recent submergence is, that the “area thus described is now covered by deposits, containing the remains of aquatic animals belonging to tertiary species.” When, therefore, it is considered that amongst this number, there are the remains of several *existing* species, by the confession of geologists themselves, *we* have a decisive proof that immense changes have taken place since the Mosaic creation; for we can never give up to the speculating cosmogonist those distinct passages of scripture which declare, that all living creatures were created at the same time with the human race. We would not, indeed, be thought to say, that none have been brought into being subsequent to that period; but we affirm, on scriptural authority, that none of them were in existence prior to the “six days’ work,” described by Moses. Now, we find marine shells of this date at the elevation of one thousand feet on one of the Welsh mountains, at a depth of from two to four thousand below the surface of the Alps, and almost at the foot of Apennine hills, two thousand feet in height. This great change of level is allowed by geologists to have occurred during their “tertiary epoch;” that is, in scriptural language, since the creation of man. There is no middle ground of opinion to him who believes that “in six days the Lord made heaven and earth, the sea and all that in them is, and rested on the seventh day: wherefore the Lord blessed the sabbath-day, and hallowed it.”

Every new discovery in geognosy only tends further to convince us that we understand but little of the agencies which have long been at work upon the surface of our globe. The *ordinary* flow of springs and rivers is producing vast changes in an incredibly short time; but the more powerful operations of floods, volcanoes, earthquakes, and a general deluge, defy all

human calculations respecting their mighty effects. The little that is known is of so astounding a character as to make the reflecting mind pause, before it ventures upon hazardous speculations in the mysterious recesses of patriarchal history.

FOSSIL REMAINS.

WE ought to bestow a few remarks upon the grand argument of modern geologists for the antiquity of our globe, and for a succession of epochas before the creation of man, deduced from the numerous fossil remains that have been discovered in the earth's strata, and which have been carefully arranged into distinct classes and genera, according to their known or supposed similarity to existing animals. They are said to have been regular in their deposition, and to have required a considerable time for the separate existence of each species, thus arguing an immense period for the entire stratification. Several parts of this hypothesis have been too hastily assumed, and the theories built upon them cannot be sustained by sufficient proof. Such is the distinction of species, the manner in which the deposits were effected, and the length of time required for their completion ; to each of which points we shall now briefly advert.

Special attention was paid to the subject of organic remains by the celebrated Cuvier, who, in making a classification of the different genera and species, formed a system in accordance with his own geological theory. But a careful student of nature, whilst he gives the full meed of praise to the patient investigations of that illustrious physiologist, and whilst he readily admits many of the *facts* which he has recorded, will be cautious how he assents to any theory grounded upon the *ipse dixit* of any philosopher. We may assent to all the discoveries of Cuvier, whilst we repudiate his system. We may give full credence to the statements which he has made respecting the nature and formation of fossil bones, whilst we object to the relevancy of his deductions, and find some flaws in his course of argument. The following is the substance of his proposition: "Every organized individual forms an entire system of its own, all the parts of which mutually correspond and concur to produce a

certain definite purpose by reciprocal re-action, or by combining towards the same end. Hence none of these separate parts can change their forms without a corresponding change on the other parts of the same animal, and, consequently, each of these parts, taken separately, indicates all the other parts to which it has belonged. Thus, if the viscera of an animal are so organized as only to be fitted for the digestion of recent flesh, it is also requisite that the jaws should be so constructed as to fit them for devouring their prey; the claws must be constructed for seizing and tearing it to pieces; the teeth for cutting and dividing its flesh; the entire system of the limbs, or organs of motion, for pursuing and overtaking it; and the organs of sense for discovering it at a distance. Hence any one who observes the print of a cloven foot, may conclude that it has been left by a ruminant animal, and regard the conclusion as equally certain with any other in physics or in morals. Consequently, this single foot-mark clearly indicates to the observer the forms of the teeth, of the jaws, of the vertebræ, of all the leg-bones, thighs, shoulders, and of the trunk of the body of the animal that left the mark."

Now, whilst we cannot but admire the beauty of such an adaptation of structure to the wants and habits of various animals, and whilst awarding to the Baron all the praise due to the discovery of so fine a view of the Creator's wisdom, we cannot altogether agree with the last consequence which he has drawn. A "single foot-mark" might indicate the presence of any species with which we were intimately acquainted, the prints of whose feet we had been accustomed to trace; or it might demonstrate the *general nature* of the creature to which such a foot belongs; but no amount of physiological knowledge would cause an *unknown* trace to make us acquainted with the entire structure of the animal, as Cuvier has suggested. He draws too largely upon our faith in his deductions, for which he has not furnished sufficient data. We may assent to his conclusion in the second-last sentence of the above quotation, whilst we demur to the truth of the following one. The "print of a cloven foot may convince us that it has been left by a ruminant animal;" but it will not indicate the form of the nostrils, the contour of the ear, the shape of each limb, and the existence or length of the horns. Beasts of prey have not a similar acumen in all their senses; some being famous for sight, others for scent, others for hearing. In this reasoning, there is a leap from

general to particular, which true logic will not admit. Yet from this position Cuvier argues, that the smallest piece of bone may become the sure index of the class and species of the animal to which it belonged. It "may" be so; but it is only to the skilful anatomist, who thoroughly understands every part of his subject by repeated examination. And if it requires a long period of careful study to become so perfectly conversant with the bones of the human body, as to know the value of every prominence and indenture, what must be the labour of acquiring this knowledge concerning all the families of living creatures!

In the above quotation, an error occurs in the use of the word "species" for "genus;" and a great deal of false reasoning may proceed from such a mistake. It is well to define the precise meaning which we wish to attach to every scientific term. For instance, there is the *class* mammalia, *order* digitata, *family* feræ, *genus* of dogs, and *species* of greyhound, terrier, &c. Some naturalists may include the wolf and fox in the same genus as dogs; but we object to this vague classification, as tending to produce unnecessary confusion. Whether *genus* be here rightly used or not, does not belong to the present question; if not, some other word must be used in its place; but if adopted with respect to one division of animals, it ought to be similarly used in describing others. Wolves and dogs have never been found naturally to merge into one another; therefore we regard them as being of distinct genera, according to the plain idea of *generation* conveyed in the Latin word which we have borrowed. Wherever animals will freely mix together in *breeding*, we regard them as belonging to the same *genus*. We cannot, then, agree with the conclusion of Mr. Lyell, after an elaborate argument upon this subject, that "species have a real existence in nature, and that each was endowed at the time of its creation with the attributes and organization by which it is now distinguished." But we claim the following allowances which he makes as to the variation of species: "There is a capacity in all species to accommodate themselves, to a certain extent, to a change of external circumstances;" which change "is usually attended by some modifications of the form, colour, size, structure, or other particulars;" that "some acquired peculiarities of form, structure, and instinct, are transmissible to the offspring;" and that the "entire variation of the original type which any given kind of change can produce, may usually be effected in a brief

period of time." We disagree with him, however, when he says, "After which no farther deviation can be obtained by continuing to alter the circumstances, though ever so gradually;" which, though perhaps true of an individual animal, is not so of a species; as we know from the successive changes which take place in the breeds of dogs, sheep, horses, oxen, &c., in different parts of the world.

When we have once employed a distinctive term in natural history, we should rigidly adhere to the same shade of meaning in all our future arguments, or else we may reason in a very fallacious manner. Thus, to talk of the dog species, and afterwards of the species of greyhound, is varying the use of the distinguishing noun; for if we choose to speak of the dog as a species, we must employ another word to denote the different kinds or races of dogs; but if we call it a genus, (according to the etymology of the word,) we may then employ species to point out its various subdivisions.

Granting to Cuvier the transcendent skill in comparative anatomy which his admirers have attributed to him, by supposing him to have been familiar with every bone and muscle of each family and order of terrestrial animals, we may deny the relevancy of his conjectures concerning individual species. We know that the profound anatomist may instantly declare any given bones to belong to the human kind, and even pronounce many of them to have formed portions of a male or female skeleton; and from the peculiar shape of the skull, he may be correct in deciding to which of the great divisions of mankind it had appertained; but is he prepared to tell from a part of any bone, that it was a portion of a Laplander, Syrian, Indian, Tartar, one of the Mongolian races, or an American or Malay Negro? Can the zoologist, upon inspecting a bone or "part of a bone" of a dog, horse, or sheep, tell us to which of the numerous and ever-changing species of these genera it has belonged? Yet it is upon such an absolute distinction of never-varying species, that a main part of the present geological theories are founded.

A grazier or horse-dealer knows very well that he can mix breeds, and produce an essential change upon his flocks or cattle; so that, by repeated alterations, the existing species shall in a short time be altogether modified. We have seen sheep in England without horns, and others with small horns: in Scotland, there are hardier kinds, with horns of larger size and

different form: and in Wales, a most diminutive breed may be found feeding near to others of a much larger variety. These variations prevail in the little island of Britain, and their pastures are only separated by a few mountains, which are traversed every day. Yet the differences between these sheep do not seem more prominent than the distinctions upon which Cuvier pronounces some of his fossil animals to have belonged to a different *epoch* from existing species. Farther, we have seen some extraordinary sheep in Syria; and we have observed others in Africa, whose horns might vie with those of English oxen. Suppose the latter to be crossed by a British breed, and then to die off, what would be the future kind of prevailing species? And how marvellous would a skeleton of the old African sheep appear to a novice, though it had been almost contemporary with the new mongrel breed!

Several species of dogs are known to have perished from our own land, and others to owe their preservation only to the fostering care of man: but which of the existing species would have been recognised by our ancestors five hundred years ago? Or, supposing an old French geologist, ignorant of British zoology, to have found the bones of an English dray-horse, of a first-rate hunter, and of a little Shetland pony, lying together in a mountain cavern; what would have been his emotions? Yet, what is our little island as a breeding-place compared with the world? In fact, if geologists are to mark their epochs by the change of mere species, and to determine its distinctions by a difference of size, shape, or horns, they rely upon grounds which we cannot allow to be sufficient.

To show that we are not exaggerating their statements, let us take a few specimens from an abstract of Cuvier's physiological researches concerning ancient fossils.

Two kinds of *lepus* are found in fissures of limestone rocks in cette: one of them "greatly resembles the common rabbit;" the other is "one third less."

Several species of *canis* have been discovered in the caves of Gaylenreuth, Bavaria; "one very closely resembles the Cape-hyæna;" another "is allied to the dog or wolf;" and a third "is almost identical with the common fox."

Fossil teeth of the *equus* are found in alluvial soils, with those of the elephant, rhinoceros, hyæna, mastodon, and tiger; but they "are larger than teeth of the common horse."

Skulls of the *bos* have been met with in England, Scotland,

France, Germany, and America; differing from the present species in "being larger, and the direction of the horns rather different." The fossil buffalo of Siberia is "of great size, and *appears* to belong to a species not at present extant."

One of the fossil *hippopotami* mentioned by Cuvier, is so very nearly allied to the existing species, that "it is difficult to determine whether or no it is the same." The other is "much smaller."

But as if to set at nought all the theories of modern speculators upon the relative antiquity of organic remains, whole carcasses of the rhinoceros and mammoth, with their flesh and skin, have been recently found in the wilds of Siberia. It is true that they have been preserved in ice; yet we hope that it is not thereby to be inferred that they have continued in this state for more than eight thousand years. Bones of the same animals are discovered in many parts of Europe,—including Great Britain,—in conjunction with those of the animals above detailed, and of other species *not now known*. This proves to a demonstration, that all these creatures were alive at the same epoch with those whose flesh is now met with, and that none of them can have been long extinct.

Cuvier admits, that fossil roes and crocodiles of existing species have been found along with the *palæotherium*: and one such instance is sufficient to overthrow the whole theory of successive genera and species. From another quarter, we learn, "that bones of the *mammoth* have been taken from North-Cliff, in Yorkshire, along with regular layers of thirteen species of *living British testacea*. This settles the point of relative antiquity, and overturns the gorgeous structures of recent cosmology.

A few years ago, it was affirmed that there were no human skeletons in a fossil state—thus showing the posterior origin of man. Recent discoveries have destroyed this position, and have put a new difficulty in the way of geologists. In the caverns of France, human remains have been found along with those of *extinct* quadrupeds;—which Dr. Buckland endeavours to explain "by the common practice of mankind, in all ages, to bury their dead in such convenient repositories." Yet, we would ask, Is it indeed a custom to inter our relatives in the dens of wild beasts? These may have *subsequently* come to feed upon the corpses; but such a hypothesis would prove too much for the geologist, (though the natural way of accounting for the

matter,) by implying that those beasts of prey were coeval with, or posterior to, the human family.

Naturalists must not find fault with our disagreeing from them on the subject of species, seeing that it is a point of variance amongst themselves. Cuvier enumerates three divisions of the human family; Lawrence and others maintain that there are five; some affirm these to be distinct *species*; others look upon them as mere *varieties*. But if, with Moses, we trace all these various kinds of human form to a single pair of ancestors, we may surely allow as great variations to have taken place in the brute creation. And there is far more difference between the skull of a Malay Negro and that of an Englishman, than between the fossil and existing skeletons of the animals above mentioned. So that, if Cuvier's distinguishing marks constitute an essential difference of species, the minor divisions of Natural History require to be remodelled.

We acknowledge those real distinctions which never merge together in a line of propagation; but inferior marks are constantly changing. The genera of dogs and sheep will always keep separate, by the impassable barrier of natural constitution: but a progeny of bull-terriers may live in the same neighbourhood with the parent stocks; and how great the difference between a thorough bull-dog and a terrier! Supposing these to be preserved, and the mongrel breed to be wholly swept away by a local flood, and their remains to be deposited in a bed of alluvial soil; what would future geologists say, upon the discovery of so strange a species? May we not argue on behalf of oxen, elephants, or tigers, in the same way as about the canine race? Besides, if climate, food, and occupation, have caused so great a distinction in the forms of *men*, we know not what changes they might produce on the inferior animals, or how rapidly those alterations might be effected. For our own part, a detail of Baron Cuvier and Dr. Buckland's researches conveys a very clear conviction that all quadrupeds yet discovered in a fossil state were contemporary with the descendants of Adam.

That many species have died off, and whole families become extinct, need create no surprise, when we consider that the influence of man has frequently united with that of floods, earthquakes, and volcanoes, to extirpate many animals from the earth. Wolves and beavers no longer inhabit our own country; the hippopotamus has perished from the Nile; and similar changes have doubtless occurred in other localities. A satisfactory

reason may be assigned for the lack of human remains, with those of birds, on the well-founded supposition that few of the fossil animals died a natural death, but were brought to a premature end by some sudden catastrophe, which was avoided by the rational inhabitants and the feathered tribes.

We have not yet particularly adverted to the diversity of species in *testacea*, upon which late geologists build the principal part of their systems. A wrong view of this subject was primarily taken, in order to substantiate a favourite hypothesis; and it seems to have been heedlessly followed by succeeding physiologists. We know comparatively little of the smaller shell-fish, and therefore we cannot tell how much they may be affected by a change of water, place, or temperature. They may vary with as much readiness as some land-animals: if so, we should expect a greater alteration in their character, from their being subject to a greater number of important casualties. Mineral springs are incessantly pouring a large quantity of foreign matter into the bosom of the deep; and storms transport shells to other localities, or throw them in heaps upon the shore.

Yet, though ignorant of the amount of influence which may be produced upon testacea by the presence of mineral waters, the following statement would argue it to be of considerable importance. Mr. Lyell informs us, that in the *etangs* at the mouth of the Rhone, "fluvatile and marine shells often live together in brackish water; but the uncongenial nature of the fluid usually produces a dwarfish size, and sometimes gives rise to strange varieties in size and colour." One fact of this kind is enough to take away all confidence in the distinction of epochs by a slight change in the appearance of fossil shells; especially when we consider the minuteness of these changes, according to the confession of geologists—being such as the prolongation of the back-bone, prominences of the thorax, &c.

Nor can we forget that the depths of ocean are still unknown; so that none can affirm of the supposed extinct species that they are absolutely lost. Late French writers incline to a contrary opinion; which, if proved in a single case, will destroy the speculations of modern cosmogony.

In order to exclude a supposition so fatal to their day-dreams, Dr. Pye Smith and others affirm, that the fossils were natives of the locality where their imbedded remains have been discovered. "The fossils referred to (in slate) are arranged along the surfaces of deposit, in such positions and regularity, as show that

the animals lived and died on the spot which has preserved their remains. An area of soft clay at the bottom of a primeval ocean was deposited, and received its living tenants with their shelly habitations." Without stopping to inquire where the *clay* came from, at that early period of the world's birth, according to Dr. Smith; we find Dr. Buckland giving a very different statement of the death of fossil fishes: "The greater number present no appearance of having perished by mechanical violence. They seem rather to have been destroyed by some noxious qualities imparted to the waters in which they moved, either by sudden changes of temperature, or an admixture of carbonic acid or sulphuretted hydrogen gas, or of bituminous or earthy matter in the form of mud." That the latter of these opinions is probably correct, may be inferred from the fact of great quantities of fish being found dead immediately after an earthquake, and from numerous shells being thrown ashore by the vast wave which has usually followed such a convulsion of the ground. This view of the subject excludes the notion of a long period for the formation of strata containing such fossils, and rather argues that they were quickly deposited by the same cause which destroyed the neighbouring fishes. Dr. Smith, however, assumes a contrary hypothesis to be true; and upon this mere supposition, proceeds to calculate the number of centuries required for laying each of the strata! He has not, however, settled the matter with Dr. Buckland: and we first ask, which of the two is right?

A great delusion seems to exist in the mind of certain geologists respecting "equivalent strata." The rocks of one country are said to correspond in age with those of another, when they agree in the *order* of materials of which they are composed, and in a similarity of organic remains. This doctrine is unsound. Rocks may be composed of similar particles at very different epochs: and the same tribes of animals may prevail in diverse seas or districts of territory at periods widely removed from each other. To say that any particular stratum in England was formed at the same time with a homogeneous one in America, is to build upon a foundation that has never been laid. Yet Mr. Lyell presumes upon this assumption to announce, that the Pyrenees arose between the deposition of our secondary and tertiary strata; and he informs us of similar occurrences, with as much *sang froid* as if he had been present during the elevation of all our mountainous districts. A spread of the human species has occurred

in different lands at different epochs ; so that analogy would teach us to reason in the same way concerning the finny and brute creation. We know, from historical facts, that some animals periodically migrate to distant countries, and that others occasionally retire from their wonted haunts, and multiply in places where they were previously unknown. History, therefore, leads us to draw inferences very contrary to the geological scheme. Besides, as cosmogonists seem now inclined to renounce the doctrine of periodical revolutions, or extensive changes in the surface of our globe, the notion of "equivalent strata" must be abandoned as inconsistent with the idea of limited alterations. The two cannot be logically held together. If the secondary and tertiary rocks of different countries were formed at the same time, then there *were* geological epochs and grand catastrophes. But if Nature has always been carrying on her operations in a gradual manner, and in small patches, we infer that similar strata were not deposited in distant regions at the same period. The two hypotheses destroy one another. Yet some geologists embrace them both ; whilst others, like Sir Humphrey Davy, prefer the plan of successive destructions and creations of animate nature. It is evident that until this essential point be settled amongst themselves, and proved to the satisfaction of the world, they have no right to claim our assent to any of their *consequent* theories.

DEDUCTIONS.

WE have thus examined Geology upon its own merits, and having weighed each system in the balance of reason, we have found it "wanting." We have also placed the chief authors in juxta-position with one another, and compared the value of their testimony : upon which we have discovered that they essentially differ in those very points which are requisite to establish the principles of the science. Again : upon examining many facts brought forward by themselves to support their own hypotheses, we have proved that most illogical arguments have been drawn from such *data*, which are otherwise of no real value, because of their conflicting character ; and that these very facts may be made

to substantiate an opposite conclusion. Upon the whole, we have tried the plan of *reductio ad absurdum*, and found it to answer our purpose; by knocking down all modern theories, and leaving the ancient one of Moses alone standing. With this latter, we have not presumed to interfere, because it rests upon grounds of a higher order than can be claimed by the most exalted wisdom of man. We might argue that Moses was one of the greatest philosophers that ever lived; and that, as he flourished nearly four thousand years ago, he ought to be more acquainted with the events of primitive times than any number of modern philosophers. Yet strong as this position would be, we do not rest upon it; for the patriarch's teaching is upheld by its Divine authority—an authority which can be substantiated by the proper kinds of evidence.

Mathematicians, unfortunately, are prone to look upon that sort of proof which is called demonstrative as being entitled to peculiar credit, or even as the only perfect mode of argument: they are generally so immersed in the abstruse calculation of quantities, that they hesitate to admit any truth that cannot be tested by their favourite mathematics. They have carried this kind of reasoning to the highest pitch of nicety, whilst their other powers of discernment are often in an infantile condition, from sheer neglect or distrust of their ability. We do not state this point in too strong a manner; nor do we underrate the evidence of numbers, when we decline placing it on a superior footing to experiment and experience, in an application to the practical affairs of life. Man is gifted with reasoning powers of different characters, to suit the numerous subjects which he may be required to investigate, or with which he ought to be fully conversant. Each of these orders of reasoning is necessary in its place, nor can its office be properly assigned to another; and when they are all rightly cultivated, we do not know that they differ much in the strength of their testimony. Conviction is the end of all evidence; and if it be produced, more cannot be effected. Scientific men may tell us that demonstrative evidence is *necessarily* true, whilst other kinds *may be* incorrect, and are consequently of inferior value; but this is a philosophic delusion; for if the mind be perfectly satisfied, no sort of proof can lead to higher results, or be of greater practical weight.

Let us take the case of a barrister-at-law, who has been accustomed to examine witnesses, and whose acuteness in this department has been whetted to a high degree. Imagine him to be

using all his skill in a trial where the subject of mere testimony is involved ; several persons professing to have been witnesses of a certain transaction : the lawyer's object is to discover a flaw in their evidence, by subjecting them to the process of a rigid cross-examination ; but he fails in detecting the least inaccuracy in any of their statements :—would he not then be as morally certain of the truth of the account, as any mathematician could be of the results of an algebraic equation ? No amount of figures could add satisfaction to the barrister's mind ; no geometrical problem could be more implicitly relied upon. And does not the philosopher expect that we shall receive *his* account of his own mathematical discoveries ? He hopes to be instantly credited, without waiting until all the public shall have learned the science of numbers, so as to verify his calculations. He labours in his art, under the idea of his testimony being honourably received.

Again : many criminals have been convicted upon *circumstantial* evidence, in cases where the judge and jury have had no more doubt concerning the prisoner's guilt, than if they had seen him perpetrate the felonious action. An astronomer might profess to despise the judgment of these uneducated jurors, (especially if any of them were to deny that the earth revolves round the sun,) and to ridicule the evidence of mere *experience* ; but he himself proceeds upon the very same grounds. For whilst he boasts that mathematics carry with them an absolute certainty of truth, this only holds good with respect to the calculation of numbers, not in their application to practical purposes ; for in the different branches of physical science, much depends upon correct *observations*,—a fact which at once reduces the evidence to the same level with others of an experimental character.

The philologist, accomplished in ancient literature and antiquarian researches, feels as much at home amidst manuscripts and versions, as Laplace did amidst stars and planets : give him a sufficient number of copies, and he will decide upon the antiquity and genuineness of an author, with as perfect satisfaction as if he had a telescope which could reach into the vista of past ages, and see the sage gazing upon his parchment by the glimmering light of the midnight oil. With adequate materials, he will detect any false reading, and point out the meaning of an intricate passage, with as much certainty as if he had calculated it by algebra. There is no obscurity in the subject in his apprehension ; not half so much, perhaps, as he feels respecting the motions of the planets, or the mountains of the moon. If, then, the mathematician

require a linguist to rely upon his figures, the philologist has as much right to demand credence of the astronomer in an affair of books and language.

Whilst a student of physics explains the nature and forces of mechanical powers, and argues the precise effects which may be expected to proceed from any defined cause,—the elements of which knowledge were first acquired from *observation*, and the subsequent calculations were made upon the assurance of similar results occurring under similar circumstances, that is, upon the ground of *experience*,—he would think it strange if the historian or moralist should turn away from his demonstration with a sceptical laugh. Has he then a right to sneer at the Bible, and the religious truths contained in its sacred pages, which the most accomplished linguists and moralists have declared to be Divine, after a laborious and rigid investigation? The theologian who has studied the philology of Scripture, weighed its proofs, experienced its renewing influence in himself, and seen its moral effects on the dispositions and lives of others, is just as sure of its truth as Sir Isaac Newton was convinced that the sun is the centre of our planetary system. He has not the shadow of a doubt upon his mind, he is as certain as reason and feeling can make him of the divine authority of the Bible. And there is a multitude of such witnesses,—compared with whose number, eminent astronomers are only as a drop of the bucket; so that the evidence of scripture is superior to that of astronomy in the numerical value of its witnesses, as well as in the simplicity of its investigation.

It is upon these grounds that we bring forward the Mosaic history of the creation, and claim for it the most reverential deference. "Through faith we understand that the worlds were framed by the word of God, so that things which are seen were not made of things which do appear," (Heb. xi. 3.)—is nearly all that we can hope to comprehend upon this *sublime and mysterious subject*.

We are satisfied that Dr. Pye Smith, in his geological lectures, has only "darkened counsel by words without wisdom," and has endeavoured to introduce a most unwarrantable mode of biblical exposition. There is neither logic nor divinity in his feeble attempt to reconcile scripture with his cosmological speculations. It is true that he professes great respect for the sacred volume,

and exclaims against the narrow-mindedness of those finical Christians who cannot allow a little latitude of interpretation, so that religion and Geology may be made to speak the same thing: but the nature and extent of the demands made upon our biblical liberality would seriously infringe upon the integrity of the sacred record. For, if we allow the simple narrative to be wrong in its detail of facts, or admit the plain language of Genesis to be highly figurative, then we can place no confidence in the more recondite doctrines and abstruse passages, which rest upon the same foundation of divine authority. Most geologists wish to interpret the Bible so as to enlist it on their own side, promising that they will then lend their assistance in corroborating its testimony; thus virtually detracting from its weight and diminishing its importance, by making it seem to depend upon the aid of science,—a subject which is quite foreign to the genius of its revelations.

On the other hand, some Christian commentators have done no little disservice to the cause for which they have been pleading, by endeavouring to twist the sense of every word relating to physical subjects, incidentally mentioned in the divine communications, to make them harmonize with the peculiar views of modern discovery. Had the Almighty spoken to the Jews according to his own knowledge of the universe and its courses, they would not have understood a sentence of his law: and, notwithstanding the superiority of our acquirements, we should probably be as much perplexed and confounded, were He to send us a message, worded according to the perfection of infinite wisdom. It would refer to subjects of which we have no idea, and contain technical terms which we could not possibly decipher. When we read the Lord's communications to his people of old, we should ask what meaning a pious Jew would have attributed to the phraseology; nor is this difficult to a philologist, who is acquainted with the manners, customs, language, and idioms of that ancient people. Here is the province of a commentator; and though a few words and passages still continue unexplained, from our ignorance of some current notions and natural phenomena of former times, the greater part of the volume has been clearly deciphered, and its meaning unfolded in the most satisfactory manner.

Would Dr. Smith ever dream of instructing a tribe of rude Hottentots in the creation of the world by a Supreme Being, in the language of a modern geologist? Would he not try to give

his narrative in such simple ideas as their infantile minds could comprehend? His object would be to convey a doctrine of faith and morals, not to teach the science of astronomy. He would make a simple narrative, divested as much as possible of philosophical terms and physical knowledge; for these would only puzzle his scholars, or draw off their attention to other subjects, by exciting an ill-timed curiosity. But though very brief in his account, the little that he gave would be perfectly *agreeable to truth*: otherwise, when they came to be better informed, and found out the falsity of a part of his instructions, they would doubt his veracity, and reject the whole of his communications. Should he, for instance, tell them that God made the world in six days, when he believed it to have been in sixty thousand years, this would be an untruth; for the one account would have been as easily understood as the other. Should he say that God destroyed the old world by a flood, because of man's sin, when himself disbelieved in a general deluge, supposing it only to have been one of nature's usual casualties; his teaching would contain a double falsehood, by conveying a wrong impression of the fact, and attributing it to an erroneous cause. Should he preach from St. Peter that the present world will be destroyed by fire, whilst he expects a mere series of geological inundations and earthquakes, from the customary effects of volcanic agency; this could never be reconciled with Christian sincerity; for all St. Peter's correspondents understood the nature of flood and fire. Were he to expound the good providence of Deity in the common way, as unfolded in the promises of Deuteronomy, the sermon on the mount, and the epistles of St. Paul; whilst in his conscience he thought that all matter and fluids were invested with certain *laws* of a never-varying character, and that the Almighty Governor never interfered with these *natural causes*; it would be difficult to acquit him of *pious fraud* or religious trickery. Finally, were he to enforce the observance of a sabbath-day from the reasons mentioned in the fourth commandment, or to urge the truth of the gospel from the evidence of miracles, while he secretly held the tenets of Cuvier, Laplace, or Babbage, we should suspect him of being influenced by the same motives as Numa Pompilius, or the Mahometan impostor.

We conceive, therefore, that modern cosmology, taken as a whole, does seriously interfere with the simple truth of scriptural narrative; and that it is the Christian's duty to expose

its fallacies, without adding to the confusion, by showing any needless bigotry to old opinions, or propagating a new hypothesis.

COSMOLOGY is also at variance with the *analogy* of nature, both physical and moral. There is a fitness and harmony in the works of God, which has powerfully affected every thoughtful mind. There is an adaptation of the outward world to the wants and conveniencies of animal and vegetable life; a suitability between the material and mental constitutions; a harmony between both of these and the moral condition of man; and a wisdom in the providential government of the whole, which we think to be strangely traversed by late geological speculations. Here we oppose the sons of science on their own favourite ground—the contemplation of nature,—but from a more extensive range of observation than they have been accustomed to take. Whilst they complain of our rejecting their theoretical dogmas, we do so because of the contracted as well as the extravagant character of their views. They have been so deeply engrossed with the earthy parts of our globe, that they seem to have forgotten its rational inhabitants; and whilst they have been speculating upon the mode in which God has made and governed the material world, they have omitted a most important consideration in reference to its tenants, who are his moral subjects.

Mr. Lyell says that “all fluctuations in the animate creation must, in a great measure, depend upon vicissitudes in the inorganic world.” We would reverse the order of this argument, preferring that the house be built or altered for the sake of its inhabitants, rather than that the inhabitants be changed for the sake of the house. The latter notion may agree with the poverty of man, who, when he cannot repair his mansion, lets it out to a humbler tenant; but it is inconsistent with the riches of Divine Providence. Mr. Lyell seems to perceive no beauty save in certain grand and immutable laws of nature, by whose unreflecting operations many genera and species of creatures have been successively destroyed; “the Author of nature,” meanwhile, looking on with ineffable complacency, and creating new families whenever the former became extinct. *Analogy* is not answered by an exclusive view of the exterior part of the universe. Who would think of pronouncing upon

the origin of a nation, or the nature of its government, from the survey of a town without its inhabitants? Now it is a fact, that there is an animal, intellectual, and moral population within the bounds of our mundane system; and when we inquire into the doings of an almighty Creator, we must take the whole into consideration, at least in so far as our capabilities will allow. The analogy of nature is violated by a partial argument like that of Geology. To reason upon the manner of creation, or upon the laws of providence, from data afforded by the material world alone, is most unphilosophical, and cannot but prove inconclusive.

This is a legitimate mode of argument. Where we see innumerable proofs of skill, and mutual adaptation in the several parts of a body, we are irresistibly led to conclude that they were made for one another. This is grounded upon the same evidence of experience as that from which we expect the tides to rise and fall; it has always been so, and we look for its happening again. We therefore maintain, that the moral and physical history of our globe must go hand in hand; and that without knowing the former, we cannot entertain a correct opinion of the latter. But cosmologists profess to write a history of the one, without hazarding a conjecture upon the other; in doing which they violate the harmony of universal nature, by attempting to separate its component parts; whilst the Bible narrative is truly scientific, because it gives a sketch of the whole together.

FEW of our English geologists and astronomers have steered clear of error in their description of nature's laws. Whilst rendering all honour to an omnipotent Creator, they entrench upon the scriptural doctrine of his *providential government*. The Bible regards him as not only upholding the grand fabric which he originated, in all its parts, courses, and dependencies; but as also interposing in the direction of events, in order to promote a moral and disciplinary regimen. Philosophers seem to entertain the notion, that when God made the universe, he instituted some general laws for its governance, and assigned to each of them a certain province and power of action, by which the course of nature is always regulated. These are supposed to carry on the whole concern, the world being given up to their undisturbed control; and if Deity be at all present in the dis-

position of events, it is only in virtue of his upholding these laws in their original constitution.

Sir John Herschel says, "The divine Author of the universe cannot be supposed to have laid down particular laws, enumerating all individual contingencies, which his materials have understood and obey: this would be to attribute to him the imperfections of human legislation; but rather, by enduing them with certain fixed qualities and powers, he has impressed them in their origin with the spirit, not the letter, of his law, and made all their subsequent combinations and relations inevitable consequences of this first impression." This is most ambiguous and illogical phraseology; for how can matter be impressed with the *spirit* of a law? It is true that Sir John states, "We would no way be understood to deny the constant exercise of his direct power, in maintaining the system of nature; or the ultimate emanation of every energy which material agents exert from his immediate will, acting in conformity with his own laws." Here is an endeavour to explain away the fatalism of the former paragraph; yet, putting the very best interpretation upon it, the meaning seems far from satisfactory. For why interpose these laws of nature between the Deity and the emanation of his will? They can have no efficacy save from the immediate working of his power; being the regular modes of his economy, the way in which he pleases to conduct his administration. For the good of animals, and especially of mankind, he performs his ordinary purposes in a regular and systematic manner; otherwise, there would be no room for the exercise of human wisdom or forethought. In a world of complete uncertainty, experience could not exist, and understanding would be of little service: so that, if there were no definite courses of nature, reason would be a useless gift to the human family. But these usual modes do not cause nature to operate, nor can they direct her processes; since she is not possessed of any inherent power or wisdom to effectuate any purpose. Instead, therefore, of saying that nature is governed by certain laws, it would be more proper to affirm that she is *ordered by Providence according to certain laws*.

Mr. Lyell, after describing several scores of geological systems, that had all given way to succeeding speculations, propounds one of his own, on the supposition of a constant uniformity being observed in the action of physical laws. He repudiates all idea of "revolutions in the economy of nature;"

and affirms that "we are entitled to assume that the laws which regulate the subterranean forces" (by which he supposes the action to be carried on) "are constant and uniform, until some convincing proofs can be adduced to the contrary." "Our estimate of the value of all geological evidence, and the interest derived from the investigation of the earth's history, must depend entirely on the degree of confidence which we feel in regard to the permanency of the laws of nature. Their immutable constancy alone can enable us to reason from analogy, by the strict rules of induction, respecting the events of former ages; or, by a comparison of the state of things at two distinct geological epochs, to arrive at the knowledge of general principles in the economy of our terrestrial system."

But this ground of his theory is the very thing which Mr. Lyell should have first endeavoured to substantiate; especially as so many eminent writers have been of a different opinion: for if his foundation be proved untenable, the whole of his system must necessarily be inconclusive. He is aware that many serious changes have taken place in the universe; changes for which others have accounted on the supposition of an alteration in the economy of things. He denies this position by affirming that similar causes are still in operation, and that they are only altered in the extent of their range, or the locality of their action. So he transmutes islands and continents at a single word; by a breath, he raises the most prodigious volcanoes; to suit a variation of temperature, he makes the equator and polar regions to change places, and the highest mountains to step over to the other side of the globe. He supposes, indeed, that Dame Nature is usually slow and gentle in her goings, more given to rolling snow-balls than kicking foot-balls; but sometimes she does not disdain the most expeditious method. Mr. Lyell would persuade us that all this is done according to her "uniform and constant operations:" but if so, we have not yet formed any acquaintanceship with her, and we are wholly ignorant of her ordinary gait and manners. As we have no authentic record of a single interchange of continents having taken place, it seems strange to argue for its being a constant practice, upon the ground of "analogy."

It is highly illogical to pass from small things to great, without one intervening stepping-stone. Sir Isaac Newton did not attempt to prove that the planets move round the sun, because a stone falls to the ground; but, having demonstrated the

former truth by applying mathematics to accurate astronomic observations, he afterwards found the minor question to be contained in the larger, through its answering to the same general laws of physics. Yet as a small stone cannot be a sufficient foundation for a large building, so we cannot prove the existence of a general usage, because we have witnessed a petty operation of a similar character. We could not rightly argue that the globe is full of fire, from having seen a volcano belching its liquid flames: for, upon the same principle, we might declare it to be filled with water or with ashes. A few monsters are occasionally brought forth, and, according to history, we know that it has been so in former ages; but this is no reason for believing in a regular succession of prodigies, which would alter the character of the human family, or tend to depopulate the world. So false a mode of argument would put us on the same level with ancient theorists, who, from the procreation of a few gigantic forms, imagined a previous race of giants to have existed, from which their own pigmy bodies were a sad degeneration. Such a tradition was long cherished and credited, though now it is proved to have been a mere fable.

So, when geologists tell us that Nature is now in a quiescent state, compared with what she once was, when all the wonderful changes of our strata were accomplished, we ask for historical proofs of their assertion; and when Mr. Lyell, repudiating *their* hypothesis, maintains that the gradual processes of Nature through an immense period of time will produce complete revolutions in the external world, we deny that he has any premisses to support such extravagant conclusions. Other men of science teach the *stability* of our system from the perceived uniformity of known laws; so that they are of an opposite opinion from Mr. Lyell on this part of the argument. In building a scheme to suit his favourite notions of heat and volcanic agency, he has forgotten to consider the other parts of nature:—his is a fairy castle, beautiful and gorgeously adorned, but built in the air, so that no man can hope to reach it without borrowing the wings of imagination; which reason and logic refuse to do, and therefore they must be content with viewing it afar off. On another occasion, Mr. Lyell observes: “If, during the short period since South America has been colonized by Europeans, we have proof of alterations of level at the three principal ports on the western shores, Callao, Valparaiso, and Conception, we cannot for a moment suspect that these cities, so distant from each other, have been selected as the pecu-

liar points where the desolating power of the earthquake has expended its chief fury:—a geologist must attribute no small discrimination and malignity to the subterranean force, if he should suppose it to spare habitually a line of coast many thousand miles in length, with the exception of those few spots where populous towns have been erected." Here we quite agree with Mr. Lyell, that any one who imagines the earthquake to be an independent power, may readily wonder at such discernment in its operations; but whoever believes in a Supreme Lord, overruling his own universe and directing his own servants, will not be at all surprised at the occasional manifestation of his anger in punishing a wicked people. Our geologist may be assured, upon the solemn authority of scripture, that Deity does so, without the least "malignity," according to the purest principles of a righteous judicature. The Bible gives us numerous examples of such penal visitations, especially that of Sodom and Gomorrah, where *Nature* had no power of interference, being caused by the angelic messengers of an insulted God. If Mr. Lyell's position be maintained, the Bible must be regarded as teaching a vile imposture; because it describes these calamitous events as the penal visitations of our Moral Governor.

PERHAPS there has not been a more objectionable writer on philosophic subjects, in our own country and times, than Mr. Charles Babbage. His "fragment," which he has chosen to term "the Ninth Bridgewater Treatise," is replete with erroneous views of the Divine Government. Having embraced the wildest theories of modern Geology, and reconciled them (in his own mind) with astronomical speculations of a similar cast, he would fain bring both reason and religion down to the level of his puerile fancies. He appears to have taken umbrage at an assertion of Mr. Whewell, that minds which have been wholly devoted to mathematical deductions are often rendered less fit and ready to apprehend and accept truths of a different class, because they have not been accustomed to exercise the powers of their understanding upon other subjects than those connected with their favourite science. Mr. Whewell very charitably accounts for this failing, (which has been the wonder and complaint of general society for many years,) from "the exclusive pursuit of particular trains and modes of reasoning, till the mind becomes less capable

of forming the conceptions and making the exertions which are requisite for the apprehension of truths not included in its usual subjects of thought." But Mr. Babbage wishes to show that the current opinion is incorrect; and, like the maniac who strove to prove that he was not mad, by arguments of so fantastic a nature as to convince every one of his actual derangement, he only furnishes an additional proof that the world is not far wrong in its belief. Mr. Whewell could not have a better example of his doctrine than that furnished by "the Ninth Bridgewater Treatise," the very title and introduction to which prepare the mind for something peculiarly strange.

It would appear that Mr. Babbage has invented a calculating machine, on the plan of which he imagines the world to have been created; and because its evolutions are performed with great exactness, according to the will of the person who arranges its *stops*, before putting it into motion, he supposes that Deity first set in order the laws of Nature, with certain pre-arranged causes of changes, in which provision was made for every contingency that has happened since the beginning. Our author seems to have obtained a new moral light, when thus viewing the world as a simple piece of mechanism; and he is enraptured with the fancied wisdom of the Great Contriver, who devised a calculating machine on so large a scale.

Forgetting that Deity is an *Eternal Now*, Mr. Babbage regards him as foreknowing and pre-arranging the universe like a finite creature, whose operations are confined to a particular period, and whose work, when once finished, would not require any further superintendence, or admit of any new modifications. On this ground, he tries to take away the value of *miracles*, by regarding them as necessary evolutions in the world's machinery: consequently, the workers of miracles were very adroit mathematicians, being able to calculate the precise period when such pre-arranged irregularities would take place. "The object of the present chapter," says he in chapter viii., "is to show that it is more consistent with the attributes of Deity to look upon miracles, not as deviations from the laws assigned by the Almighty for the government of matter and of mind; but as the exact fulfilment of much more extensive laws than we suppose to exist." In this view of the subject, man's belief in miracles is only a proof of the weakness or limited nature of his understanding!

The scepticism of the following passages is counterbalanced by their extravagance: "The waves of the air thus raised" (by the

human voice) "perambulate the earth and ocean's surface, and in less than twenty hours every atom of its atmosphere takes up the altered movement due to that infinitesimal portion of the primitive motion which has been conveyed to it through countless channels, and which must continue to influence its path throughout its future existence.—If man enjoyed a larger command over mathematical analysis, his knowledge of these motions would be more extensive; but a being possessed of unbounded knowledge of that science could trace every the minutest consequence of that primary impulse; would distinctly foresee and might absolutely predict, for any, even the remotest, period of time, the circumstances and future history of every particle of that atmosphere.—The air itself is one vast library, on whose pages are for ever written all that man has ever said or woman whispered. There in these mutable but unerring characters, mixed with the earliest as well as the latest sighs of mortality, stand for ever recorded, vows unredeemed, promises unfulfilled, perpetuating in the united movement of each particle the testimony of man's changeful will. But if the air we breathe is the never-failing historian of the sentiments we have uttered, earth, air, and ocean are the eternal witnesses of the acts we have done." If such be the case, we do hope that our posterity will never become expert mathematicians, or else they will be acquainted with our most secret thoughts, words, and actions! But if Mr. Babbage had ever been exposed to a tempest on land, or a storm at sea, he would have entertained great fears for the safety of his aëriel library, lest its contents should have been so thoroughly mixed together as to be no more intelligible.

Mr. Babbage seems perfectly ignorant of logic, and of any kind of evidence save that of figures. Yet, though cosmogonists cannot adduce a particle of mathematical evidence on behalf of their speculations, he takes it for granted that they are fully substantiated; forgetting that there is any difference between a belief in the existence of certain facts, and the reason of their production,—between a perception of the *effect*, and an admission of an adequate *cause*. He says, "To those who are unacquainted with this science, (Geology,) or indeed to any person not deeply versed in the history of this and kindred subjects, it is impossible to convey a just impression of the nature of that evidence by which a multitude of its conclusions are supported;—evidence in many cases so irresistible, that the records of the past ages to which it refers are traced in language more imperishable than

that of the historian of any human transaction: the relics of those beings entombed in the strata, which myriads of centuries have heaped upon their graves, giving a present evidence of their past existence with which no human testimony can compete." This is hyperbole indeed! But since the hieroglyphics of ancient history are so indelibly fixed in the rocks, it does seem a pity that they should be so ambiguous that they cannot be deciphered with any degree of confidence as to the result; since those who are most "deeply versed" in the science differ from one another upon almost every part of the subject.

It would be highly amusing to see our philosopher in a barrister's place, attending to the examination of witnesses. The truth of their testimony would require to be calculated by Laplace's doctrine of probabilities: so that an involved case of circumstantial evidence would occupy the best mathematicians for a long period of time; indeed, both the accused and the accusers would doubtlessly die of old age before all the needful calculations could have been completed. There would be no necessity for a judge, jury, or barrister; algebra would solve the whole question on *demonstrative grounds*. In conformity with this novel practice of deciding upon human testimony, Mr. Babbage agrees with Hume's main argument against miracles; (and therefore against scripture;) only differing from him on one point, which is afterwards explained away in a note. We shall give a specimen of this curious piece of argument, that it may, by its folly, serve as an antidote to the sceptical opinions thrown out by modern men of science.

"The condition, therefore, in regard to the testimony, is, that the *improbability* of its falsehood must be greater than the occurrence of the fact. Hume asserts that this condition cannot be fulfilled by the evidence of *any number* of witnesses, because our experience of the truth of human testimony is not uniform and without any exceptions; whereas, our evidence of the course of nature, or our experience against miracles, is uniform and uninterrupted." But Hume appears to have been but slightly acquainted with the doctrine of "probabilities." After stating that one of the most important principles on which the question rests, is the "concurrence of the testimony of independent witnesses," Mr. Babbage proceeds: "Let us examine what is the probability of a statement about to be made by two such persons," (who will speak the truth, and who are not themselves deceived in ninety-nine cases out of a hundred,) "absolutely

unknown to, and unconnected with, each other." This, according to Laplace, is calculated at one ten thousandth; and the probability of the falsehood of a fact which six such independent witnesses attest is 1,000,000,000,000 to one against the falsehood of their testimony. On the other hand, the improbability of the miracle of a dead man being restored, is 200,000,000,000 to one, which is one fifth less than the former. Mr. Babbage, therefore, affirms, that the miracle is possible, and deserves our belief; but he subjoins, in a note, "It is to be observed, that the whole of this argument applies to *independent* witnesses. The probability of the collusion, or the degree of credit to be assigned to witnesses under any given circumstances, depends on facts which have not yet been sufficiently collected to become the subject of mathematical inquiry."

It needs no great acuteness to discover the tendency of the above remarks, especially of the last quotation; and it ill becomes Dr. Pye Smith, who often refers to the "Ninth Bridgewater Treatise" to find fault with those Christian divines who look suspiciously upon the speculations of modern Geology. Mr. Babbage's work acknowledges the necessity of an Infinite Creator; but its whole tendency is to exclude the interpositions of a presiding Providence, and to deny the common grounds of belief in a divine revelation. If no other testimony is to be received than that of algebra and Laplace's calculation of chances, Mr. Babbage will find it hard to convince us that his book is the production of a sane mind, since it contains so many points which militate against the dictates of common sense. Besides, according to Laplace's theory, we certainly ought to renounce these views of Nature's laws, because there are names on the other side of the question for which we have a higher veneration, and which are consequently more deserving of credit.

SIR ISAAC NEWTON declares that the various portions of the world, organic and inorganic, "can be the effect of nothing else than the wisdom and skill of a powerful and ever-living Agent, who, being in all places, is more able by his will to move the bodies within his boundless uniform *sensorium*, and thereby to form and reform the parts of the universe, than we are by our will to move the parts of our own bodies."—"All these things He rules, as the Lord of all."

Clarke, the friend of Newton, says, "All things which we commonly say are the effects of the natural powers of matter and laws of motion, are, indeed, if we speak strictly and properly, the effects of God's acting upon matter continually, and at every moment, either immediately by himself, or mediately by some created intelligent being. Consequently, there is no such thing as the course of nature, or the power of nature, independent of the effects produced by the will of God."

Although some of Mr. Whewell's phraseology, in the commencement of his reasonings upon this subject, is of rather an equivocal construction, yet this want of precision in the use of words doubtlessly proceeded from his employing them in the ordinary philosophical mode; for nothing can be more explicit than his own creed, when deliberately stated. "The laws of material nature, such as we have described them, operate at all times and in all places; affect every province of the universe, and involve every relation of its parts. Wherever these laws appear, we have a manifestation of the intelligence by which they were established. But a law supposes an agent, and a power; for it is the mode according to which the agent proceeds, the order according to which the power acts. Without the presence of such an agent, of such a power, conscious of the relations on which the law depends, producing the effects which the law prescribes, the law can have no efficacy, no existence. Hence we infer, that the intelligence by which the law is ordained, the power by which it is put in action, must be present at all times, and in all places where the effects of the law occur; that thus the knowledge and the agency of the Divine Being pervade every portion of the universe, producing all action and passion, all permanence and change. The laws of nature are the laws which he in his wisdom prescribes to his own acts; his universal presence is the necessary condition of any course of events, his universal agency the only origin of any efficient force."

With such a meaning attached to this modish phraseology, we can have no objections to use, for brevity's sake, the term, *laws of nature*, or *laws* of gravitation, heat, electricity, motion, &c.; though we object to that of *laws of matter*, as being destitute of any signification, unless it be supposed to mean those secondary influences by which matter is acted upon: in which case the phrase is improper in an etymological view. We do not regard a *law* as implying a power *possessed* by nature, but a command given to it by the Supreme Being, whose omnipresent will con-

veys the power as well as the ordinance. It does not signify that nature *acts* by this law, but *is acted upon* or *directed* in conformity with it, by the omnipotence of Jehovah. It does not suppose that God once arranged the whole system, and now considers himself to be for ever bound by his former mode of procedure ; but that He, of his own pleasure, continues to work on a similar plan for the good of his creatures, especially of the rational kind. So far, therefore, from excluding Him from interposing in the *events* of his own world, we regard him as always presiding over its management ; and although he seldom varies from his usual *mode* of operation, that he may thus prevent any violation of nature's regularity, he so modifies and directs its invisible springs as to exhibit the justice and wisdom of a Moral Governor. Thus is a special Providence reconciled with the general care of a Creator, and the regular ordinances of a physical Disposer. In this way only can science be brought to harmonize with Revelation.

Whilst we admit the existence of steady and general laws, we should object to use the terms *fixed* and *universal*. For, upon extraordinary occasions, Deity might think fit to suspend his usual modes of acting, where it would highly become a Moral Governor to do so : and providential rule is only glorious where it shows forth moral grandeur. To say that God has instituted *unalterable* laws of nature, is to limit the Most High, and affirm what we cannot prove. Indeed, we have ample testimony to the contrary, in the authenticated miracles of scripture. The winds and waves were hushed at the Saviour's bidding ; he walked on the waters ; he raised the dead ; he gave sight to the blind, and unstopped the deaf ears ; by his word he made the lame man to leap as an hart ; by a touch, he cured an ear that had been cut off with the sword ; and at his crucifixion, the sun, moon, and stars were supernaturally clothed with sackcloth. Our evidence of these interferences with the usual course of events is irresistible ; and it seems almost impious to affirm, that the Almighty has made rules for himself, from which he cannot deviate.

So, we cannot approve of Mr. Whewell's expression, that these laws "affect every province of the universe." It is sufficient for us to know that they regulate our own system and its cosmical arrangements. What takes place beyond us, in the regions of infinite space, we cannot tell. Indeed, the laws are not absolutely general. If some bodies move, and some are stationary, *motion* is not a general law. If some substances are

highly electrified, and others are not, *electricity* is not universal. If the earth was once hotter than it is now, the causes or influences of *heat* have been modified. So the reasons for the variation of the mariners' compass have not been ascertained; therefore, we dare not affirm that *magnetism* is the same in all places. If, as astronomers say, many nebulous bodies are seen to flit about in the heavens, and some distant stars are observed to move round one another; even *gravitation* may not every where exist. Are comets bound by the same law in their eccentric orbits?

Who can thoughtfully affirm that the laws of nature which affect us are universal, unless he be able to tell us how the balance of the winds is preserved, *why* a high situation is cold, and the seasons are varied in the same locality, how geological changes have taken place, what has caused the variation of species, why volcanoes are active or indolent, and many other points of inquiry which show the limited character of human knowledge? On the contrary, we believe that these laws are not universal; else there could be no special providences, or answers to prayer, (according to the promises of scripture,) without a constant disruption of the system and course of nature. But should we suppose these laws to be limited in their extent, and just to terminate beyond the reach of human ken, we then allow space for Deity to be ever modifying the particulars, without disturbing the general course of his empire; whilst we retain every assignable reason for his working by usual processes. At the very terminus of mortal investigation, he may treasure up those springs of action, by moving which, he changes a thousand special objects without appearing to contravert any general law; for man cannot tell where the one begins, and the other terminates, or how they are harmoniously blended together.

We can trace the nerves, by which the power of motion is communicated to a human organ, as far as their origin in the brain, where, in the mysterious *sensorium*, they are played upon by the spirit, whose agency commences where material action ceases. So the laws of nature may be like nerves of the world, coming under the direct control of the great Spirit at that point where sight fails, and where man's researches cannot hope to penetrate.

MODERN philosophers see nothing but the working of physical laws in all the grand alterations of earthy matter. The Bible owns nothing but the "hand of God." They are so occupied with the material universe, that they seem to look upon it as a separate part of creation, complete in itself, and independent of others; so that any change in its forms would be a disruption of the harmony and symmetry of the vast machine. The scriptures regard it as a mere adjunct of a nobler workmanship; a house, which has been reared for the accommodation of animal creatures, and the schooling of intellectual spirits, which, however skilfully built and tastefully arranged, is of no importance, save in respect of its inhabitants; to serve whom, both its garniture and walls may be altered or remodelled, at the will of a heavenly Architect. Philosophers look only at a Lord of *physical* nature; and imagining that he "works by geometry," like themselves, they regard any deviation from mathematical precision as fatal to the honour of his government. Religion fixes her regard upon a *moral* Sovereign, mainly intent upon a spiritual jurisdiction, to which all cosmical arrangements are rendered subservient, as of a mere temporary and adventitious character: hence, every change or suspension of nature's laws has had immediate reference to moral transactions.

Nature herself, and all her usual courses, were paralyzed, when He frowned upon a guilty world, and drowned it in a flood. Acoustics were confounded at the building of Babel. Atmospheric pressure had no play in that shower of "fire and brimstone" which descended upon wretched Sodom. Hydraulics were suspended, whilst the Israelites crossed the Red Sea in their flight from oppressive Egypt; whilst the ark passed through the bed of Jordan on its way into the promised Canaan, and when Elijah's mantle smote the roaring flood, in attestation that the spirit of his office had descended upon Elisha. Volcanic fury could do no injury to Moses, when he received the law amidst the terrors of Sinai. The earth delayed its diurnal movements at Joshua's command, that the Israelites might have light to destroy their enemies. The laws of motion trembled, when Jericho's walls fell down at the blast of the sacred trumpets; and its usual energies were miraculously quickened when Jesus stepped into the ship, and it was immediately carried to its destined port. Meteorology forgot its ordinary courses, when Elijah prayed against backsliding Israel; when he again interceded on their behalf, after the land had been dried up for three years and a half; when summer's heat

produced a winter's storm at the call of neglected Samuel ; and when a raging wind and sea cowered at the Saviour's more than magic word. Gravitation itself floated the iron hatchet at Elisha's wish to serve his people's need ; and it had no power when Christ walked over the roaring waves. The nervous, muscular, and membranous systems of the human frame obeyed the Redeemer's voice, in preference to the laws of nature's disease, when he attested his divine character by the might of his works : the flow of blood ceased at his reproof, and circulated afresh after death at his bidding. The vegetable world felt the power of his word when he cursed the barren fig-tree, and it instantly withered away. The finny tribes came voluntarily into the net of his disciples, when he wished to supply their wants ; and a fish picked up a piece of money from the bottom of the deep, and brought it to Peter's hook, when a miracle was necessary to procure the tribute-money for him and his Divine Master. Finally, an unwonted eclipse of all the heavenly bodies, and a disruption of earth and hades, occurred at the ever-memorable crucifixion, when Jesus died to atone for the sins of a ruined world.

These are some examples out of sacred history, where the known laws of nature were directly traversed at the will of Deity ; and every Christian must allow the inferences, that these laws are not *necessarily* uniform, according to the phraseology adopted by most of our geological writers ; and, therefore, we accuse them of impugning the truths of holy writ.

WHILST Geology keeps within her own province in describing the present crust of the earth, and the orders of its strata ; in pointing out and classifying its minerals and organic remains ; in furnishing the naturalist with information upon geognostic appearances and changes, and in supplying the miner and agriculturist with knowledge available to their arts ; so long we will hail her as a worthy daughter of science, and offer to her delineators the tribute of our admiration and respect. But when she leaves the walks of experience, to enter upon the unknown regions of speculation ; when she attempts to decipher creation, and scan the purposes of Infinite Wisdom ; when she presumes to fathom the depths of a past eternity, in shadowing forth the fancied revolutions that took place long before man's birth, or previous to any authentic records of science ; when she

strives to scale the heavens without a ladder, in asserting the universality of those laws of which she understands neither the origin nor the extent; when she would limit the Infinite by binding him with his own ordinances, and would refuse him the privilege of modifying his own constitutions, and ruling as he pleases over his own creatures; and when she would explain the high and holy proclamations of the Bible in a way to suit her own puerile fantasies, and alter the records of Heaven's chancery to meet her limited knowledge and ever-varying chimeras; then does she exclude herself from the pale of our deference; and whilst reason laughs at her folly, and religion frowns upon her madness, we must treat her as the shapeless offspring of an airy fancy, or the untoward child of unholy presumption.

THE END.

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